Eth. J. Indig. Know. Appl. Sci.
Vol. 3, No. 1, 2025, 22-29

Ethiopian Journal of Indigenous Knowledge and Applied Sciences

Calpurnia aurea (Alt.) Benth: A Review of Its Ethnobotanical, Phytochemical, and Pharmacological Properties

Asaye Asfaw [1*] and Wondimagegn Mengist [2]

[12] Department of natural resource management, Debre Birhan University, Ethiopia

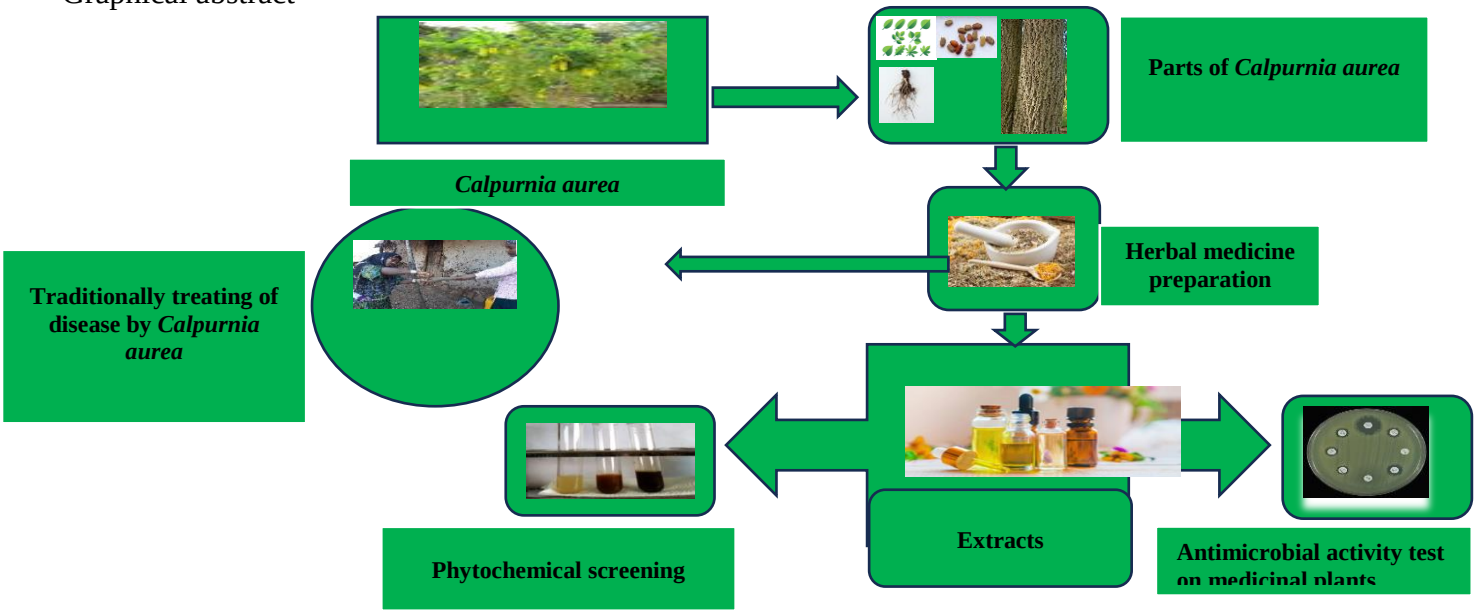
.

Abstract

(*Calpurnia aurea* (Alt.) Benth is an accepted name for a species within the genus Calpurnia, belonging to the family Fabaceae. The primary objective of this review was to explore the traditional uses of *Calpurnia aurea* (*C. aurea*) for the treatment of various human and livestock diseases. The study evaluated utilization of parts of this plant for mediation, its methods of preparation, and routes of administration. It included studies on phytochemical extraction, characterization, and pharmacological activities. However, as the main objective of this study was to review studies on phytochemical extraction, characterization, and pharmacological activities, the word "also' should be avoided.

The review also includes findings related to phytochemical extraction, characterization, and the pharmacological activities associated with *C. aurea*. It relied on secondary information sourced from relevant ethnobotanical literatures and published studies. Although practices regarding its use may vary, local populations commonly employ the roots, leaves, and seeds of the plant to treat various ailments in humans and livestock, because it's notable bioactive compounds. *C. aurea* contains a diverse array of secondary metabolites, including alkaloids, terpenoids, saponins, cardiac glycosides, steroids, phenols, flavonoids, anthraquinones, and tannins. While various pharmacological properties of the extracts have been experimentally tested, comprehensive scientific explorations and detailed investigations are still needed.

Graphical abstract



Keywords: Antimicrobial activities,Lattice; *Calpurnia aurea*; phytochemical analysis, traditional uses

*Corresponding author: *leulasaye@yahoo.com*

Received: Dec. 20/2024, Revised **Nev. 10/2024,** **Accepted**: Jan 17/2025, **Published**: Feb 1/2024.

1. Introduction

Humans to treat and manage diseases since ancient times have utilized medicinal plants [1]. Several studies indicate that medicinal plants are still in use in both developed and developing countries, largely due to the emergence of drug-resistant bacteria and the increasing adverse effects associated with chemical medications [1, 2]. The plant family Fabaceae is one of the largest Family in the number of medicinal plants [1]. The family Fabaceae encompasses all legumes, commonly referred to as pea or bean plants. Among the largest families of flowering plants worldwide, Fabaceae ranks as the third largest, comprising approximately 20,000 species classified into about 800 genera [3]. The most prevalent and largest genera include Astragalus, which contains over 2,400 species; Acacia, with more than 950 species; and Indigofera and Crotalaria, each with around 700 species. Additionally, Mimosa has approximately 500 species, collectively representing about 9.4% of all flowering plant species [4]. The family Leguminosae is further divided into three subfamilies: Papilionoideae, Caesalpinioideae, and Mimosoideae. These subfamilies are sometimes recognized as separate and independent families, and their flowers are useful for identification.

They exhibit extremely diverse characteristics [5]. The primary and distinctive feature of this family is the presence of root nodules that contain Rhizobium bacteria, which are capable of converting atmospheric nitrogen (inert) into usable forms. Species within this family range from herbs to trees [6]. Occasionally, these subfamilies are recognized as separate and independent families.

Economically, they represent the third largest group of plant families and are utilized as crops, green manures, pulses, oil crops, fruits, root and tuber crops, industrial crops, and forage species [7]. Additionally, they are essential for synthesizing a wide variety of natural products, including flavors, poisons, dyes, and hold significant importance for medicinal purposes [8]. The members of this family are cosmopolitan in their distribution and abundant in forests [7]. Traditionally, many Fabaceae plants have provided safe and effective therapies for the treatment of various diseases in both humans and livestock [1].

C. aurea belongs to the Fabaceae family and is widely distributed in India, as well as in Africa, particularly in South Africa and eastern Africa, especially in Ethiopia and Eritrea [9]. This species thrives in fertile, well-drained soil with ample water during the summer [10]. It typically grows in forests, along forest margins, and in clearings. In forested areas, it can reach heights of 9 to 15 meters, while in open areas, it is more commonly found as a shrub or small tree, measuring 3 to 4 meters tall [11].

C. aurea has numerous traditional medicinal applications. Local communities utilize its leaves and seeds to treat various internal and external ailments in both humans and livestock. Several studies have demonstrated that C. *aurea* is effective in preventing insect bites and ectoparasites in livestock [12]. A variety of phytochemical compounds with medicinal properties have been isolated from different parts of the plant by various researchers [13-15]. These compounds exhibit antimicrobial and antifungal effects [16, 17]. However, many of these studies remain at a preliminary stage, indicating a need for more comprehensive investigations, particularly regarding phytochemical extraction, isolation, and pharmacological testing.

Nowadays, the study of how local communities utilize medicinal plants is a major focus in the field of ethnobotany. As a result, numerous research projects on ethnobotanical uses, phytochemical analysis, and efficacy testing are being conducted in various parts of the world. However, uses of specific medicinal plants, their bioactive compounds, and their roles in modern applications have not been compiled separately.

Therefore, the primary purpose of this paper was to review the status of *C. aurea* in terms of its traditional medicinal uses, phytochemical extractions, and pharmacological activities.

2. Review Method

To achieve the objectives of this review a comprehensive examination of books, review articles, original research journal publications, and ethnobotanical texts on *C. aurea* was conducted. A literature search for this review involved an online search of established databases to access books and reputable scholarly articles. The search was limited to articles written in English and was conducted between March 1900 and April 2024, using key search terms such as “ethnobotany of *C. aurea*,” “traditional uses of *C. aurea*,” “phytochemical profile of *C. aurea*,” “active ingredients of *C. aurea*,” and “diseases treated by *C. aurea*,” were among others.

This study searched Clarivate's Web of Science, Scopus, Google Scholar, and PubMed for papers published from 1990 to April 2024 with the topics “ethnobotany of *C. aurea*,” “traditional uses of *C. aurea*,” “phytochemical profile of *C. aurea*,” “active ingredients of *C. aurea*,” and “diseases treated by *C. aurea*”. The earliest related literature found was published in 1984, so the researchers adjusted the time-span of the literature search from 1984 to 2024. The criteria for including articles in this review were: (i) articles must be published in English language and (ii) literature must be from peer-reviewed scientific journals and institutional documents published until April 2024.However, this review work excluded non English articles

3. Results and Discussion

3.1 A Botanical Description of Calpurnia aurea

The genus Calpurnia comprises several species, some of which are endemic to South Africa. *C. aurea* is the most widespread species, commonly found in various regions of sub-Saharan Africa and present in southern India. The name of the genus is derived from Calpurnius, a Roman poet who sought to emulate the renowned Virgil. consequently, the name Calpurnius was selected for the morphologically similar genus Calpurnia [18].

C. aurea is a small, multi-stemmed tree, typically reaching heights of 1 to 5 meters (occasionally up to 10 meters) but rarely exceeding 5 meters. The species features a stem diameter of up to 10 centimeters, with bark that is pale brown and darkens with age. The leaves are arranged alternately in a compound formation on stalks approximately 25 centimeters long, consisting of 5 to 15 pairs of leaflets plus a terminal leaflet. These leaflets are

oblong, pale green, and measure about 2.5 centimeters, each ending in a fine hair-like tip. The flowers are bright yellow and pea-shaped, measuring around 2.5 centimeters across, and are clustered in dense heads on stalks that range from 7 to 24 centimeters in length. The largest petal appears almost split in half (Figure 1.A). The fruit consists of thin, membranous pods measuring 12 centimeters in length, pale yellow-brown in color, with one edge slightly winged, containing 4 to 8 seeds. The unopened pods (Figure 1.B) remain on the tree for an extended period.

A. The golden yellow flower of *C. aurea*

B. Pod and seeds of *C. aurea*

Source...accessed from http://

www.truthfinder.com on 26 February 2025

As shown in Table 1, the species has different names in Ethiopia across different localities and societies.

***Table 1*. Local names of C. aurea in Ethiopia**

Local names	
Amharic	Digita
Afan Oromo	Ceekaa
Tgrigna	Hetsawus
English name	Natal Laburnum
Sidamigna	Chekata

C. aurea is a multi-stemmed woody shrub plant that belongs to the Fabaceae family and Table 2 shows its detailed botanical classification.

***Table 2*. Scientific classification of C. aurea**

	Taxonomic classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fabales
Family	Fabaceae
Genus	Calpurnia
Species	*Calpurnia. aurea*

3.2 Ecology and Geographic Distribution of *Calpurnia aurea*

C. aurea thrives in the highlands of East Africa, extending from Eritrea in the north to as far west as the Central African Republic, Zaire, and Angola, and reaching south to South Africa. It is also prevalent in southern India [19]. In Ethiopia, it is particularly abundant in the mountainous regions across all provinces [19]. This species is commonly found in forest margins, as well as in bushland and grassland areas that are favored by overgrazing. The altitudinal range of *C. aurea* spans from 1,650 to 2,550 meters (up to 3,000 meters) above sea level throughout Ethiopia [19]. The geographical distribution of *C. aurea* in Ethiopia has been mapped using coordinates from ethnobotanical research papers, with the most common occurrences found in the middle and highland areas of the country as indicated in Figure 2.

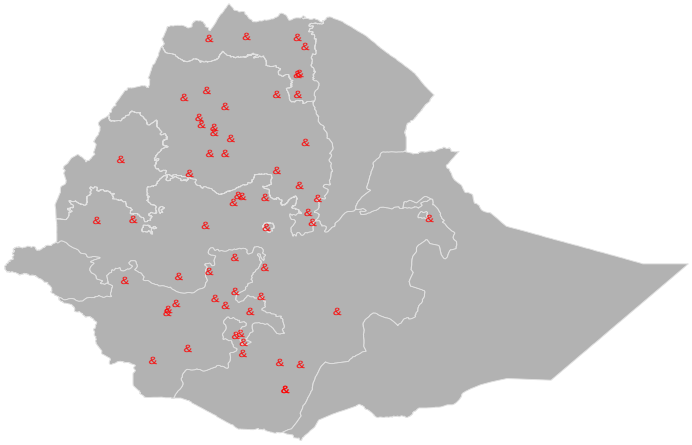


Figure 1. *The geographical distribution of* C. aurea *species in Ethiopia*

3.3 Propagation Methods

C. aurea utilizes its flowers as reproductive organs and propagates through its seeds and cuttings. The plant blooms nearly year-round, with the majority of flowers appearing after the rainy season. Calpurnia is easy to cultivate.

3.4 Medicinal and Other Uses of *Calpurnia aurea*

Although the local community utilizes the species in various ways, the most common applications include firewood, agricultural tools, bee forage, fish poison for harvesting, lice protection, live fencing, walking sticks, and ornamental purposes. Additionally, the locals use extracts from the leaves and seeds to treat various ailments, employing them as anti-rabies, anti-diarrheal, and anti-malaria agents [16]. Many research studies have indicated that *C. aurea* has various traditional medicinal properties [20]. Ethnobotanical studies have established that *C. aurea* is highly valued as a traditional medicinal plant. The findings suggest that different parts of the plant are utilized to treat a range of human and livestock ailments. This indicates that locally, people use it to treat various diseases affecting both humans and livestock. Moreover, it shows different ethnic groups, both in Ethiopia and beyond, utilize various parts of *C. aurea* to address a wide range of ailments

Traditional used parts of *C.urena*	**Locally used to treated**	**Reported by**
Leaf /Root/ seeds/fruits/stem barks/	Snake bite	Teklehaymanot and Giday [21]; Megersa, Asfaw [22]; Zerabruk and Yirga [23].
Leaf	Stomach-ache	Kidane, van Andel [24]; Teklehaymanot [25];Zerabruk and Yirga [23]; Tadeg, Mohammed [26].

Leaf /Root/ seeds/fruits/stem barks/	Diarrhea	Adedapo, Jimoh [9]; Umer, Tekewe [27]; Alemayehu, Asfaw [28]; Regassa, Bekele [29].
Leaf	Malaria	Tolossa, Debela [30]; ; Waka, Hopkins [31].
Leaf /Root/ seeds/fruits/stem barks	Amoebic dysentery	d'Avigdor, Wohlmuth [32];Teklehaymanot [25]; Adugna, GetachewTerefe [33].
Leaf	Rabies	Yineger, Yewhalaw [34];Tadeg, Mohammed [26];Giday, Teklehaymanot [35];Asfaw, Lulekal [1]
Leaf /Root/ seeds/fruits/stem barks	Diabetes mellitus	Giday, Teklehaymanot [35].
Leaf	Skin infections	Tolossa, Debela [30];Teklehaymanot [25];Agisho, Osie [36].
Leaf	Swelling or cancer	Tadeg, Mohammed [26].
Leaf	Syphilis	Tadeg, Mohammed [26];Adedapo, Jimoh [9]
Leaf	Leishmaniasis	Adedapo, Jimoh [9]; Tadeg, Mohammed [26]
Leaf	Tuberculosis	Tadeg, Mohammed [26];
Leaf	Elephantiasis	Adedapo, Jimoh [9]
Leaf /Root/ seeds/fruits/stem barks	Hypertension	d'Avigdor, Wohlmuth [32], Giday, Teklehaymanot [35]
Root/ seeds/fruits/stem barks	Giardiasis	Giday, Teklehaymanot [35]
Root/ seeds/fruits/stem barks	Vomiting	Zerabruk and Yirga [23]

The primary method of preparation involves grinding the ingredients into a powder and mixing them with various components, such as coffee and traditional beverages. Subsequently, the final traditional medicine is administered orally, which is one of the most common routes for delivering traditional medicine. Several research findings indicated that the most commonly used routes of administration for herbal medicines are the oral route [25, 29, 37, 38], dermal [36] and nasal [39].

Furthermore, this species is also important for the treatments of diseases of livestock. For instance, the local community use a herbal medicine made from different parts of *C. aurea* to treat their livestock (Table 4). This implies that *C. aurea* is a versatile plant in its medicinal uses.

Table 3 Traditional use of *C. aurea* to treat diseases of livestock

Traditional used parts of *C.urena*	**Locally used to treated**	**Reported by**
Leaf /root/seeds/stem bark	Internal and external parasites	Megersa, Asfaw [22]; Tolossa, Debela [30]; Chekole, Asfaw [40]
Leaf /root/seeds/stem bark	Snakebite	Megersa, Asfaw [22];
Leaf /root/seeds/stem bark	External wound	Adugna, GetachewTerefe [33]
Leaf /root/seeds/stem bark	Rabies disease	Tamiru, Terfa [41]
Leaf /root/seeds/stem bark	Cattle diarrhea/ *cattle dysentery*	Tadeg, Mohammed [26]
Leaf	Eye disease	Asfaw, Lulekal [42]

The preparation method involves chopping fresh or dried plant parts and mixing them with water, or using them without water. The application routes include topical [43, 44], nasal [45], and oral [46]. *C. aurea* can also serve as traditionally mosquito repellent in the area where the mosquito is prevalent [47]. Therefore, people who are living in mosquito prevalent areas can use it as malaria prevention mechanism. The whole part of the plant it is used as an insect repellent and its method of applications are laying the leaves of plants inside the house and rubbing onto clothes/skin and smoking the plant parts in the house [34, 38, 48, 49]. This implies that people can use *C. aurea* as an insect repellent, in addition to its applications in treating various ailments.

3.5 Photochemistry and pharmacological investigation reviews

The phytochemical analysis of extracts from medicinal plants is essential for discovering new phytochemical compounds, which plays a critical role in the development of novel drugs and alternative therapies. Consequently, researchers worldwide have conducted studies on the phytochemical analysis and evaluation of the bioactive chemical constituents present in various parts of *C. aurea*.

The result showed the presence of many secondary metabolites. For example, Govindappa and Poojashri [50] isolated alkaloids, terpenoids, saponins, cardiac glycosides, steroids, phenols, flavonoids, anthraquinone, and tannins from this distinguished species in South Africa. Eyasu, Shibeshi [51], Umer, Tekewe [27], and Birhanu, Wuhab [52] also extracted the same bioactive compounds from the same parts of *C. aurea* in Ethiopia using similar methods. Moreover, compounds such as flavonols, proanthocyanidins, diterpenes, calpurnine, virgiline, virgiline pyrrolecarboxylic acid ester, and lapinine have also been identified in *C. aurea* [9, 43, 52]. This indicated that various types of secondary bioactive metabolites are present in *C. aurea*, which show promise for the development of various types new drugs, which might be solutions of the emergence of drug resistance bacteria.

In addition to ethnobotanical and phytochemical screening studies, numerous experimental research projects were carried out to assess the efficacy of secondary metabolites derived from various parts of *C. aurea* with the majority yielding encouraging outcomes. Umer, Tekewe [27] conducted an experimental investigation on the anti-bacterial effects of the bioactive chemicals screened from the leaf and stem of *C. aurea* and found that the extracts have strong anti-bacterial activities and showed promising effects for isolation and drug formulation. Similar studies [33, 43, 53] were also conducted on the anti-microbial effects of *C. aurea* extracts, and arrived at the same conclusion. The explanation for this is that wherever plant growth occurs, soil characteristics, rainfall, temperature, and other environmental factors do not influence the types of secondary bioactive metabolites.

Although a study by Adedapo, Jimoh [9] indicated that the antibacterial activities of *C. aurea* extracts are not as effective as standard drugs, the leaf extracts exhibit a broad spectrum of activity and demonstrate the highest efficacy against certain pathogenic bacterial species. However, their effectiveness is concentration-dependent. This indicates that various parts of *C. aurea* exhibit antimicrobial activities, although there are, some variations in the results that may be attributed to the concentration levels used, the timing of harvesting, and the types of pathogenic bacteria tested.

Additionally, research by Eyasu, Shibeshi [51], Adugna, GetachewTerefe [33], and Birhanu, Wuhab [52] indicated that leaf extracts of *C. aurea* possess anti-protozoal properties, particularly against Plasmodium, amoeba, and Giardia species. This demonstrates that *C. aurea*, in addition to its antibacterial and antifungal activities, possesses antiparasitic properties against protozoa such as Plasmodium, amoebae, and Giardia species, which are prevalent in tropical countries, particularly in Ethiopia.

The leaf extracts also exhibit anti-molluscicidal effects [54] and can also help lower blood pressure [32, 55]. This suggests that *C. aurea* not only has antimicrobial properties but also demonstrates anti-molluscicidal effects and contributes to the management of non-communicable diseases like hypertension.

In a study by Zorloni, Penzhorn [56], the leaf extracts were evaluated for their effectiveness against head lice and ticks, revealing significant and positive results in killing these pests. This suggests that *C. aurea* can also be utilized to deter external parasites. Furthermore, root extracts demonstrate anti-mycobacterial properties [26, 57], while extracts from the stem and bark show moderate anti-cancer effects [58]. This suggests that *C. aurea*, along with its microbial, anti-protozoal, anti-molluscicidal, and anti-external parasitic properties, may also be effective in treating severe illnesses such as cancer and tuberculosis, which are often difficult to manage with conventional medications.

4. Conclusion

This review indicated that *C. aurea* is a plant species traditionally used to treat various diseases in both humans and animals, particularly in different regions of Africa. Phytochemical analyses revealed that uses various parts—especially the leaves, stems, bark, and roots—contain secondary metabolites. While extracts from *C. aurea* have undergone experimental testing for various pharmacological properties, comprehensive scientific exploration and in-depth studies remain insufficient. Previous research has not adequately addressed the analysis of toxicity levels in bioactive secondary metabolites. Furthermore, results from in vitro experiments may not yield similar outcomes when applied under actual conditions. Although *C. aurea* has been used by local communities to treat a range of ailments—including rabies, snakebites, syphilis, diabetes mellitus, leishmaniasis, elephantiasis, tuberculosis, malaria, giardiasis, eye diseases in both cattle and humans, high blood pressure, amoebic dysentery, stomach pain, and cancer—there is currently no scientific evidence or in vitro testing to support its effectiveness for these conditions. Consequently, this gap necessitates further scientific investigation. Ethiopia is home to a diverse array of potentially valuable medicinal plant species. However, factors such as changes in land use, excessive exploitation of natural resources, and overgrazing are contributing to a decline in both medicinal plants and the traditional practices associated with their uses. This situation underscores the need for a scientific approach to explore the applications of these plants. In conclusion, the authors recommend enhancing conservation efforts and thoroughly documenting traditional knowledge of *Calpurnia aurea* (Alt.) Benth and other potentially important medicinal plants.

References

[1] Asfaw, A., et al.: Documentation of traditional medicinal plants use in Ensaro District, Ethiopia: implications for plant biodiversity and indigenous knowledge conservation. *Journal of Herbal Medicine*, 2023. **38**: p. 100641.

[2] Yedjou, C.G., et al.: The management of diabetes mellitus using medicinal plants and vitamins. *International Journal of Molecular Sciences*, 2023. **24**(10): p. 9085.

[3] Lock, J. and F. MN: Legumes of the World. *London: Royal Botanic Gardens, Kew*, 2005.

[4] Judd, W., et al., Plant Systematics: a phylogenetic approach, *Sinauer Axxoc, 287-292. 2002, ISBN 0-87893-403-0.*

[5] Smýkal, P., et al.: Legume crops phylogeny and genetic diversity for science and breeding. *Critical Reviews in Plant Sciences*, 2015. **34**(1-3): p. 43-104.

[6] Fathi, G.: Al-Sghair, Mohammed H. Mahklouf. Floristic Analysis and Species Diversity of the

Family Fabaceae represented by voucher specimens Depending on the Flora of Libya. 2020, Species. p. 189-201.

[7] Xu, Z., et al., Fabaceae or leguminosae. *Identification and Control of Common Weeds:* Volume 2, 2017: p. 547-615.

[8] Duke, J.: Handbook of legumes of world economic importance. *2012: Springer Science & Business Media*.

[9] Adedapo, A.A., et al.: Antibacterial and antioxidant properties of the methanol extracts of the leaves and stems of Calpurnia aurea. *BMC Complementary and Alternative Medicine*, 2008. **8**(1): p. 53.

[10] Sita, K., et al.:Food legumes and rising temperatures: effects, adaptive functional mechanisms specific to reproductive growth stage and strategies to improve heat tolerance. *Frontiers in Plant Science*, 2017. **8**: p. 1658.

[11] Smith, N.: Fabaceae, in Amazon Fruits. *An Ethnobotanical Journey.* 2023, Springer. p. *455-592.*

[12] Adenubi, O.T.: Acaricidal efficacy of crude extracts and isolated flavonoids from Calpurnia aurea subsp. aurea against Rhipicephalus turanicus. *2017: University of Pretoria (South Africa).*

[13] Tebabal Kebede, G.: Phytochemical investigation, and assessment of antibacterial activities of Calpurnia aurea root bark. *Natural Products Chemistry Research*, 2021. **9**: p. 383.

[14] Kenubih, A., et al. Extraction and phytochemical screening of Calpurnia aurea leaves and their effect against malopaagus ovinus. *Asian Journal of Medical and Pharmaceutical Researches*, 2019. **9**(1): p. 1-10.

[15] Nefo, T., et al., *Isolation and Characterization of Flavonoid and Other Compounds from Seeds Extract of Calpurnia Aurea.* Extraction, 2019. **9**(7).

[16] Mulatu, G.: Antibacterial activities of Calpurnia aurea against selected animal pathogenic bacterial strains. *Advances in Pharmacological and Pharmaceutical Sciences*, 2020. **2020**(1): p. 8840468.

[17] Bogale, A., et al.: Antidiarrheal and antibacterial activities of Calpurnia aurea: Benth seed different extracts. *Evidence-based Complementary and Alternative Medicine*, 2022. **2022**(1): p. 9582687.

[18] Jansen, P.C.M.: Spices, condiments and medicinal plants in Ethiopia, their taxonomy and agricultural significance. 1981: [sn].

[19] Hedberg, I.: Flora of Ethiopia and Eritrea, in The Biodiversity of African Plants. 1996, *Springer. p*. 802-804.

[20] Wasihun, Y.: H. Alekaw Habteweld, and K. Dires Ayenew, Antibacterial activity and phytochemical components of leaf extract of Calpurnia aurea. *Scientific reports*, 2023. **13**(1): p. 9767.

[21] Teklehaymanot, T. and M. Giday: Ethnobotanical study of medicinal plants used by people in Zegie Peninsula, Northwestern Ethiopia. *Journal of ethnobiology and Ethnomedicine*, 2007. **3**(1): p. 12.

[22] Megersa, M., et al.: An ethnobotanical study of medicinal plants in Wayu Tuka district, east Welega zone of oromia regional state, West Ethiopia. *Journal of ethnobiology and ethnomedicine*, 2013. **9**(1): p. 68.

[23] Zerabruk, S. and G. Yirga: Traditional knowledge of medicinal plants in Gindeberet district, Western Ethiopia. *South African journal of botany*, 2012. **78**: p. 165-169.

[24] Kidane, B., et al.: Use and management of traditional medicinal plants by Maale and Ari ethnic communities in southern Ethiopia. *Journal of ethnobiology and ethnomedicine,* 2014. **10**(1): p. 46.

[25] Teklehaymanot, T.: Ethnobotanical study of knowledge and medicinal plants use by the people in Dek Island in Ethiopia. *Journal of Ethnopharmacology*, 2009. **124**(1): p. 69-78.

[26] Tadeg, H., et al.: Antimicrobial activities of some selected traditional Ethiopian medicinal plants used in the treatment of skin disorders. *Journal of ethnopharmacology*, 2005. **100**(1-2): p. 168-175.

[27] Umer, S., A. Tekewe, and N. Kebede: Antidiarrhoeal and antimicrobial activity of Calpurnia aurea leaf extract. *BMC complementary and alternative medicine*, 2013. **13**(1): p. 21.

[28] Alemayehu, G., Z. Asfaw, and E. Kelbessa: Ethnobotanical study of medicinal plants used by local communities of Minjar-Shenkora District, North Shewa Zone of Amhara Region, Ethiopia. *Journal of Medicinal Plants Studies*, 2015. **3**(6): p. 01-11.

[29] Regassa, R., T. Bekele, and M. Megersa, Ethnobotonical study of traditional medicinal plants used to treat human ailments by halaba people, southern Ethiopia. *Journal of Medicinal Plants*, 2017. **5**(4): p. 36-47.

[30] Tolossa, K., et al.: Ethno-medicinal study of plants used for treatment of human and livestock ailments by traditional healers in South Omo, Southern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 2013. **9**(1): p. 32.

[31] Waka, M., R.J. Hopkins, and C. Curtis: Ethnobotanical survey and testing of plants traditionally used against hematophagous insects in Eritrea. *Journal of ethnopharmacology*, 2004. **95**(1): p. 95-101.

[32] d'Avigdor, E., et al.: The current status of knowledge of herbal medicine and medicinal plants in Fiche, Ethiopia. *Journal of ethnobiology and ethnomedicine*, 2014. **10**(1): p. 38.

[33] Adugna, B., et al.: Potential In vitro Anti-Bacterial Action of Selected Medicinal Plants Against Escherichia coli and Three Salmonella Species. *International Journal*,2014. **5**(2): p. 85-89.

[34] Yineger, H., D. Yewhalaw, and D. Teketay: Ethnomedicinal plant knowledge and practice of the Oromo ethnic group in southwestern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 2008. **4**(1): p. 11.

[35] Giday, M., et al.: Medicinal plants of the Shinasha, Agew-awi and Amhara peoples in northwest Ethiopia. *Journal of Ethnopharmacology*, 2007. **110**(3): p. 516-525.

[36] Agisho, H., M. Osie, and T. Lambore: Traditional medicinal plants utilization, management and

threats in Hadiya Zone, Ethiopia. *Journal of Medicinal Plant Studies*, 2014. **2**(2): p. 94-108.

[37] Birhanu, Z.: Ethno-botanical survey on medicinal plants used by ethnic groups of Denbia district, north-western Ethiopia. *Journal of Natural Remedies*, 2011. **11**(2): p. 119-123.

[38] Kidane, D., Z. Tomass, and T. Dejene, Community knowledge of traditional mosquito repellent plants in Kolla Temben District, Tigray, Northern Ethiopia. *Scientific Research and Essays*, 2013. **8**(24): p. 1139-1144.

[39] Asnake, S., et al.: Survey of medicinal plants used to treat malaria by Sidama People of Boricha District, Sidama Zone, South Region of Ethiopia. *Evidence-Based Complementary and Alternative Medicine*, 2016. **2016**.

[40] Chekole, G., Z. Asfaw, and E. Kelbessa: Ethnobotanical study of medicinal plants in the environs of Tara-gedam and Amba remnant forests of Libo Kemkem District, northwest Ethiopia. *Journal of ethnobiology and ethnomedicine*, 2015. **11**(1): p. 4.

41. Tamiru, F., et al.: Ethnoknowledge of plants used in veterinary practices in Dabo Hana District, West Ethiopia. *Journal of Medicinal plants Research*, 2013. **7**(40): p. 2960-2971.

42. Asfaw, A., et al.: Medicinal plants used to treat livestock ailments in Ensaro district, North Shewa Zone, Amhara regional state, Ethiopia. *BMC Veterinary Research*, 2022. **18**(1): p. 235.

43. Soyelu, O. and Masika, P.: Antibacterial and antioxidant activities of some selected plants used for the treatment of cattle wounds in the Eastern Cape. *African Journal of Biotechnology*, 2012. **11**(14): p. 3476-3481.

44. Teklay, A., B. Abera, and Giday, M.: An ethnobotanical study of medicinal plants used in Kilte Awulaelo District, Tigray Region of Ethiopia. *Journal of ethnobiology and ethnomedicine*, 2013. **9**(1): p. 65.

45. Yigezu, Y., Haile, D.B. and Ayen, W.Y.: Ethnoveterinary medicines in four districts of Jimma zone, Ethiopia: cross sectional survey for plant species and mode of use. *BMC veterinary research*, 2014. **10**(1): p. 76.

46. Bekalo, T.H., Woodmatas, S.D. and Woldemariam, Z.A.: An ethnobotanical study of medicinal plants used by local people in the lowlands of Konta Special Woreda, southern nations, nationalities and peoples regional state, Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 2009. **5**(1): p. 26.

[47] Hiruy, B. and Getu, E.: Evaluation of Calpurnia aurea leaf extracts as natural insect repellents for stored product insect pests in Ethiopia. *All Life, 2023*. **16**(1): p. 2163303.

[48] Yirga, G., et al.: An ethnoveterinary survey of medicinal plants used to treat livestock diseases in Seharti-Samre district, Northern Ethiopia. *African Journal of Plant Science*, 2012. **6**(3): p. 113-119.

[49] Bekele, D., et al.: Ethnobotanical study of plants used for protection against insect bite and for the treatment of livestock health problems in rural areas of Akaki District, Eastern Shewa, Ethiopia. *Topclass Journal of Herbal Medicine*, 2012. **1**(2): p. 12-24.

[50] Govindappa, M. and M. Poojashri: Antimicrobial, antioxidant and in vitro anti-inflammatory activity of ethanol extract and active phytochemical screening of Wedelia trilobata (L.) Hitchc. *Journal of Pharmacognosy and Phytotherapy*, 2011. **3**(3): p. 43-51.

[51] Eyasu, M., W. Shibeshi, and M. Giday: In vivo antimalarial activity of hydromethanolic leaf extract of Calpurnia aurea (Fabaceae) in Mice infected with chloroquine sensitive Plasmodium berghei. *International Journal of Pharmacy and Pharmacology*, 2013. **2**: p. 131-42.

[52] Birhanu, Z., M. Wuhab, and T. Abula, Antimalarial activity of calpurnia aurea hydroalcoholic leaf extract in mice infected with Plasmodium berghei. *Pharmacologyonline*, 2015. **2**: p. 73-79.

[53] Muk, L., Naidoo, V. and Eloff, J.N.:*I*n vitro antibacterial activity of seven plants used traditionally to treat wound myiasis in animals in Southern Africa. *Journal of Medicinal Plants Research*, 2012. **6**(27): p. 4379-4388.

[54] Kubo, I., et al.: Quinolizine Alkaloids from the African Medicinal Plant Calpurnia aurea: Molluscicidal Activity and Structural Study by 2D-NMR. Agricultural and biological chemistry, 1984. **48**(11): p. 2839-2841.

[55] Getiye, Y., T. Tolessa, and Engidawork, E.: Antihypertensive activity of 80% methanol seed extract of Calpurnia aurea (Ait.) Benth. subsp. aurea (Fabaceae) is mediated through calcium antagonism induced vasodilation. *Journal of ethnopharmacology*, 2016. **189**: p. 99-106.

[56] Zorloni, A., B.L. Penzhorn, and J.N. Eloff, Extracts of Calpurnia aurea leaves from southern Ethiopia attract and immobilise or kill ticks. *Veterinary parasitology*, 2010. **168**(1-2): p. 160-164.

[57] Gemechu, A., et al.: In vitro Anti-mycobacterial activity of selected medicinal plants against Mycobacterium tuberculosis and Mycobacterium bovis Strains. *BMC complementary and alternative medicine*, 2013. **13**(1): p. 291.

[58] Korir, E., et al.: Isoflavones from Calpurnia aurea subsp. aurea and their anticancer activity. *African Journal of Traditional, Complementary and Alternative Medicines*, 2014. **11**(5): p. 33-37.