



An Ethnobotanical Study of a Medicinal Plant *Justicia Schimperiana* (Sensel) in Adaba and Shashemene Districts West Arsi Zone, Southern Ethiopia

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KEYWORDS:

Ethnobotany;
Justicia Schimperiana;
Medicinal plant;
Sensel;
Southern Ethiopia

ABSTRACT

Justicia schimperiana is an evergreen shrub growing in the wet part of Ethiopia. The plant is known by different names among the localities and is commonly termed *Sensel*. It is usually used for medicinal purposes for various communicable and non-communicable diseases. However, the extent of the ethnobotany of this plant has not been studied well before, so the aim of this study is to assess the palaeobotanical knowledge of the Sensel plant (*Justicia schimperiana*). Parallel to the sample plant collection, a total of 30 informants (21 male and 9 female) were selected to collect ethnobotanical information from two districts. Among the informants, 7 key informants who are known as traditional healers were selected purposefully. Ethnobotanical data were collected through semi-structured interviews and group discussions were analyzed. The study indicates that the community, mainly those of low economic status and people who have failed to be healed by modern medication from their health problems, depend on an indigenous herbal remedy medication like sensel. Hence, the sensel plant is used to prepare a remedy for human and animal diseases like rabies, hepatitis, skin diseases, communicable diseases, asthma, malaria, abdominal disorders, livestock diseases, and other human-related ritual problems.

Research article

INTRODUCTION

Background of the Study

Justicia schimperiana, a member of the Acanthaceae family, is also known as *Adhatoda schimperiana* or *Gendarussa schimperiana*. Locally, it is called dhumuugaa in Afan Oromo, sensel or simiza in Amharic, and surpa, kasha, or keteso in Sidama. This fast-growing, multi-branched shrub (2–3 m tall) thrives in wet

montane forests, riverbanks, and village hedges at altitudes of 1300–2700 m (Hedberg *et al.*, 2006). It is widely distributed in Ethiopia, Kenya, and Tanzania and is often used as a live fence (Abebe *et al.*, 1993).

In Ethiopia, the leaf decoction is traditionally consumed with local beer to treat asthma, while fresh leaves are used for contagious diseases. In Eastern Ethiopia, it serves as a laxative, while in Northern Ethiopia, alone or mixed with other

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<https://dx.doi.org/10.4314/eajbcs.v6i1.2S>

plants, it is used for mental illness, epilepsy, eye diseases, leprosy, malaria, jaundice, rabies, gonorrhea, syphilis, measles, relapsing fever, vitiligo, gout, and febrile illnesses (Abebe, 1996). In Southwest Ethiopia, fresh leaves are crushed and macerated in water for treating malaria and scabies (Teferi, 2003).

Despite its medicinal importance for human and livestock diseases, indigenous knowledge about Sensel is at risk due to its oral transmission, leading to knowledge loss and deterioration (Mesfin, 1996). Ethnobotanical studies on *Justicia* species in the Americas, Asia, and Africa have primarily focused on various ethnopharmacology, phytochemistry, and biological properties (Sundaram and Purwar, 2011). In Ethiopia, most research emphasizes traditional practitioners and the historical medico-magical and/or medico-spiritual manuscripts and ancient Gee'z manuscripts, overlooking the knowledge of local communities (Fasil, 2005). The oral transfer of herbal knowledge, however, risks losing critical information on plant use, preparation, and medicinal applications in animal and human diseases. Therefore, documentation of medicinal plants and the indigenous understanding associated with them are crucial to identify threatened medicinal plant species to present due attention to proper control and conservation (Moa, 2010).

Therefore, this study aimed to investigate the ethnobotanical information on a medicinal plant *Justicia schimperiana* (Sensel) in Adaba and Shashemene districts in Southern Ethiopia.

Ethnobotanical Background of *Justicia schimperiana*

Ethnobotany is the scientific look at the conventional know-how and customs of a human being regarding the flora and their medical, religious, and different uses. Therefore, it's far well worth explaining the conventional remedy. A Traditional Medicine (TM) is described as the whole of the know-how and practices whether explicable or inexplicable, used inside the diagnosis, prevention, and removal of physical, mental, and/or social imbalance (WHO, 1979). Since time immemorial people have discovered treatments inside their habitat, and feature exceptional healing techniques relying upon the climatic, physiographic, floral, and faunal characteristics, in addition to the abnormal cultural and socio-structural typologies. In doing so, human beings have used conventional remedies to treat diverse disorders. It has integrated plant, animal, and mineral-primarily totally based medicines, and non-secular therapies, consisting of strategies and exercises, implemented alone or in combination (Adewumi, 1991). Traditional medicine is primarily based on accumulated practical experience and observations passed down through generations, either orally or in written form. It encompasses healing practices that have existed for centuries, often predating modern medical treatments, and continue to be utilized today without widely documented adverse effects (Elujoba *et al.*, 2005)

Acanthaceae is a family of dicotyledonous flowering plants comprising almost 250 genera and about 2500 species (Reddy *et al.*, 2013). Most are tropical herbs, shrubs, or twining vines; a few are epiphytes. Only some species are allotted in temperate areas. The 4 important facilities of distribution are Indonesia and Malaysia, Africa, Brazil, and Central America. The representatives of the own circle of

relatives may be discovered in almost every habitat, inclusive of dense or open forests, in scrub lands, on moist fields and valleys, on the seacoast and in marine areas, and in swamps and as a detail of mangrove woods. *Justicia* is the most essential genus of Acanthaceae, with about six hundred species which might be discovered in pan tropical and tropical areas (Correa and Alcantara, 2012).

In Ethiopia, the shrub can most customarily be discovered in fences around homes and cultivated fields, wherein it has commonly been planted. In the wild, the plant grows at an altitude of 1250-2500 m, on mountain slopes, along roadsides, alongside rivers, in woodland and woodland edges. The plant may be discovered in plants and fruit all year-round, maximum abundantly so inside the dry duration from October until January (Sebald, 1972). *Justicia schimperiana* is shipped in excessive awareness in nearly all areas of Ethiopia and different East African nations like Eritrea, Somalia, Kenya, and Tanzania. Other research discovered that this inexperienced plant is one of the maximum abundant, widespread, and regenerative species in northwestern Ethiopia; northern Ethiopia (Haile *et al.*, 2008); Southwestern Ethiopia (Nune, 2008); and southeastern Ethiopia (Moa, 2010).

The plant grows in many of the Ethiopian ecosystems particularly in wet montane woodland, commonly close to streams and rivers, in evergreen scrub on hill slopes, woodland clearings, espresso plantations, waste floor or planted as hedges around homesteads in dry and wet `Woina Dega` and wet `Dega` agro-climatic zones in Tigray, Gondar, Gojjam, Ilubabor, Keffa, Sidamo, Shoa and Harerghe (Tesemma, 2007). *Justicia schimperiana* is

commonly propagated through cuttings, and seedlings also can be raised from it. It is likewise self-incompatible, and a totally excessive degree of geitonogamy is discovered in this species. The pollination device is anticipated to play a chief function in figuring out plant reproductive achievement within side the face of environmental variation and shaping its sample of genetic diversity. The plant is a great fence plant, forming a herbal barrier round compounds of house, and is mainly cultivated for this purpose. In Ethiopia, it does now no longer appear to be cultivated broadly for medicinal purposes (Amare, 1976).

Chemical Composition and Pharmacological Activities

Justicia schimperiana has been traditionally used for the treatment of *Diabetes mellitus*. Researchers have evaluated the hypoglycemic and antihyperglycemic activities of aqueous extract of *Justicia schimperiana* leaves in ordinary and streptozotocin-induced diabetic mice. The result showed that aqueous extract of the plant has substantial anti-hyperglycemic activity in streptozotocin-induced diabetic mice and enhancement in glucose tolerance as well as slight hypoglycemic activity in normal mice and vindicating the old claim for its use in diabetes. In addition, *Justicia schimperiana* contains alkaloids, phenols, and terpenoids. Any of these secondary metabolites may be responsible for glucose suppression in the blood (Andualem *et al.*, 2016).

It is indicated that *Justicia schimperiana* has a hepatoprotective activity which is the ability to prevent liver damage due to the presence of hydroalcoholic in the leaf extracts. As the hydroethanolic extracts offered higher

antioxidant activity, it is possible to establish the potential application of hydroalcoholic extracts from *Justicia schimperiana* in the development of products with antioxidant properties and demonstrate a promising pharmaceutical product. The methanol extracts of the plant also possess antioxidant activities. This justifies the traditional uses of *Justicia schimperiana* in Ethiopia for the treatment of some hepatic disorders and suggests the possible utilization of these plants as a source of new drugs (Umer *et al.*, 2010).

Justicia schimperiana is traditionally used for the treatment of malaria and the crude extract confirmed of the plant is endowed with anti-malarial activity. Jemal (2014) evaluated the anti-malarial activities of chloroform, methanol, and aqueous fractions of the leaves of this plant against *Plasmodium berghei* in mice. Consequently, the methanol fraction significantly prevented the reduction in rectal temperature in the 4-day suppressive, curative, and repository tests. Thus, the high antimalarial activity observed in methanol and aqueous fraction indicates that the plant's active constituents are semi-polar and polar. This proved that the traditional use of the plant could be a potential source of templates for the development of new anti-malarial agents (Jemal *et al.*, 2014).

The leave extracts of *Ruta chalepensis* and *Justicia schimperiana* were the most powerful medicinal value. The plant extraction was followed by ethanol, methanol acetone, diethyl ether, and hexane by using disc diffusion and broth dilution methods (MIC) against six human pathogenic bacterial strains (*Shigella dysentery*, *Escherichia coli*, *Streptococcus aeruginosa*, *Pseudomonas aeruginosa*, *Staphylococcus*

aureus, *Salmonella typhi*, and *Klebsiella pneumonia*). The methanol extract of *J. schimperiana* showed strong inhibition activity against *S. dysentery* and *E. coli*. Four antibiotics were used as standard for the testing of antibacterial activity against six different human pathogens. Among the antibiotics, Ciprofloxacin showed a maximum zone of inhibition ranging from 20-35mm followed by Kanamycin, Tetracycline, and Chloramphenicol (Habtamu *et al.*, 2019).

Diarrhea is one of the leading causes of preventable death in developing countries and mainly affects children and infants. It has been reported that the leaf of *Justicia schimperiana* is used as an antidiarrheal agent in northwest Ethiopia. The 80% methanolic leaf extract of *J. schimperiana* was evaluated for its activity against castor oil-induced diarrhea enter polling and gastrointestinal motility in mice. The methanolic leaf extract of *Justicia schimperiana* has an antidiarrheal activity and this supports the use of this plant in the treatment of diarrhea in traditional settings (Mekonnen *et al.*, 2018).

MATERIALS AND METHODS

Description of the Study Area

This study was conducted in Adaba and Shashemene districts in West Arsi zone Oromia regional state, Ethiopia. Adaba is located at 335 km from the capital Addis Ababa; Adaba district is bordered on the southwest by Nensebo, on the west by Dodola, on the northwest by the Shabelle River which separates it from the Gedeb Asasa, and on the east and south by Bale Zone. The astronomical location is 7.00376 latitude and 39.39063 longitudes with 7° 0' 20" N and 39°23' 38" E cordials. Its

altitude ranges from 1750 to 3400 m above sea level (West Arsi zone, 2006). The 2007 national census reported the total population of the woreda was 138,717. Adaba has an estimated population density of 63.8 people per square kilometre (CSA, 2007).

Shashamane is located at a distance of 250 km south of Addis Ababa, the capital city of Ethiopia, and 25 km north of Awassa, SNNPRS. It is bordered to the south by SNNPR, west by Siraro, north by Arsi Negele, and east by East Arsi Zone. It has a latitude of 7° 12' north and a longitude of 38° 36' east. It is situated at an average altitude of 1924 m above sea level (Figure 1).

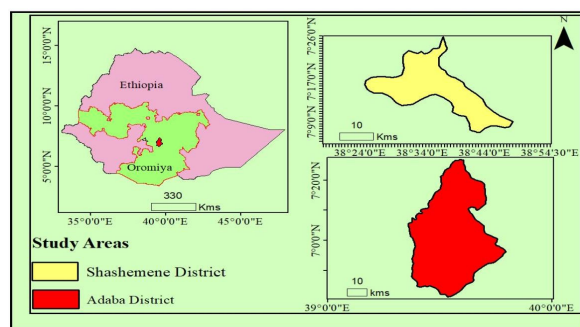


Figure 1: Map of the study area (Source: Researcher)

The rainfall of the study area is bimodal, with the main rainy season occurring between July and September. The dry season lasts from November to February, followed by the short rainy season during March and April. From the weather records of 1994-2004, the average rainfall of Adaba district was 733 - 1000 mm and the temperature ranges from 7-24⁰ C. The agroecology of the Shashemene district is categorized as Kolla (50%), Woina Dega (29%), and Dega (21%). Shashemene district receives an annual rainfall of 700–950 mm and the

minimum and maximum annual temperature of 12 °C and 27 °C, respectively. The total land coverage of the area is 76,888 ha, of which 48,975 ha is used for cropland and 7440 ha for forest land (West Arsi zone, 2006).

Sampling Research Site

The study area was selected based on the information obtained from the background studies and the researcher herself evident the concentration of medicinal plants in southern Ethiopia. As part of the medicinal plant, *Justicia schimperiana* is extensively distributed in high concentrations in almost all regions and particularly in the southern part of Ethiopia (Hedberg *et al.*, 2006). Accordingly, the researcher has made a preliminary survey in southern Ethiopia specifically in the study area on the existence and distribution of the plant. The researcher has also existing knowledge about the medicinal value of the plant at the selected research sites where the plant is abundantly grown, and people use it for different treatments. Therefore, due to the above justification, the researcher has identified Adaba and Shashemene districts as the research sites.

Sampling technique and sample size, Data collection, Data Analysis

A total of thirty (21 Male and 9 Female) informants were selected out of the two study areas, 23 (12 from Adaba and 11 from Shshemene) were selected purposely based on the availability of *sensel* around their environment as general informants. All respondents are above 40 years old. They were selected during the plant sample collection survey based on the availability of the plant on their fence, compound, and village. They were

asked to give their knowledge about the plants they were used, plant parts harvested, method of preparation for use, and other related information about the plant and its purpose. Seven (7) key informants or local healers (3 from Shashemene district and 4 from Adaba district) were selected purposively based on the recommendation from elders of the study areas.

The qualitative data were gathered through semi-structured questionnaire. Thus, the surveys were carried out from January 2020 to end of April 2021 (in three phases) using semi-structured interviews. Interview questions were determined beforehand, and some arose during the conversation to clarify the major questions in the questionnaire. Both general and ethnobotanical questions were translated to the local language for conversation. Before the administration of the interview, discussions were held to elaborate on the objective of the study and receive the consent of interviewees; and build on trust to share local knowledge

about their experience on the *Justicia schimperiana* plant.

The information gathered from the respondents was interpreted and cross-checked and secondary related literature was also consulted. Finally, a descriptive analysis was made to reconstruct the Indigenous knowledge of the respondents on the plant.

RESULTS

According to the demographic data (Table 1), the total number of respondents used to interview was 30. Among these 53.3% were from the Adaba district and 46.7 % were from the Shashemene district. Key informants were selected based on their indigenous knowledge as a traditional healer in the respective districts. Accordingly, from the total number of key informants, 57.14% of the key informants were interviewed in the Adaba district whereas the remaining 42.86% were interviewed in the Shashemene district.

Table 1: Demographic Data of general informants, key informants, Respondent's Occupation, and Respondents Knowledge about the plant

General informants				
District	Male	Female	Total	%
Adaba	11	5	16	53.3
Shashamane	10	4	14	46.7
Total	21	9	30	100
Key informants				
Adaba	3	1	4	57.14
Shashamane	3	-	3	42.86
Total	6	1	7	100
Respondents' occupation				
Occupations	Local elders	Farmers	Traditional healers	Others
In numbers	10	8	7	5
In percentage	33%	27%	23%	17%
Respondents Knowledge about the <i>sensel</i> plant				
	Medicine, livestock food and fence	Fence	Cleaning and firewood consumption	Spiritual purpose
In number	15	10	3	2
In percentage	50%	33%	10%	7%

Most of the respondents were purposively selected from various occupations based on their knowledge and experience with the use of the plant in their localities. About 10(33%) of the respondents were local elders, 8(27%) were farmers and traditional healers which accounts for 7(23%) were selected as respondents followed by 5(17%) of the respondents who are religious fathers and government employee to constituted in this study areas.

All of the respondents have knowledge about the plant mainly regarding the inhabitation of the *sensel* plant in their surroundings. As informants portrayed the plant grows both naturally and by human cultivation along their fence. The non-cultivated *sensel* plant usually grows in forests, shrubs and along the roadsides. According to the informants, they acquired the indigenous knowledge from their families who were traditional healers and informally adopted it from the community as habitual action against common diseases and for other activities.

Table 1 shows that fifteen (50%) of the respondents including key informants of the study area have knowledge of the use of the *sensel* plant for various purposes like medicinal, livestock food and fence. About ten (33%) of the respondents have mentioned that the plant is used for fencing purposes. About three (10%) portrayed the *sensel* plant also used for cleaning clay pots and for firewood consumption in the study areas. Other respondents account for two (7%) of the respondents who have suggested that the plant is used for Spiritual purposes.

The *sensel* plant widely grows in the study area both in human-made and natural ways. The plant is used by society for medicinal value in the very rear situation. It is commonly used for fencing purposes along the living quarter of the locality due to the evergreen, jungle and dense characteristics, and drought resistance nature of the plant (Figure 2).



Figure 2: *Justicia Schimperiana* (Sensel)

The indigenous knowledge of the study area indicates that the plant is used for medicinal value to humans and animals. From the part of the plant, the leave parts are used for the

extraction and remedy of various health disorders. Accordingly, the following illness is identified that the traditional healers in the study area use the plant for treatment (Table 2).

Table 2: Traditional importance of SENSEL (*Justicia Schimperiana*) plant in the society

Purpose of the plant	Part of the plant used	Preparation, combination, and remedy	Ways of Treatment
Hepatitis	Fresh leave	Squeezed and mixed with local beer	Taking a cup of coffee
Bronchial Asthma	Dried leave	Powdered and mixed with local beer	Taking half of a coffee cup
Contagious disease	Fresh leave	Chopped and diluted with water	Taking half of a coffee cup
Abdominal illness	Fresh leave	Squeezed and mixed with powder of <i>Vernonia amygdalina</i> (grawa) and <i>S. oxyacantha</i> (tenadam)	Take a coffee cup with many volumes of water daily until cured
Dermal disease	Fresh leave	Crushed and soaked with water	Washing the affected area
Rabies	Fresh leave	Crushed with calabash (<i>qel</i>)	Taking half of a coffee cup with fresh milk
Livestock disease	Leave	Squeezed, mixed with garlic and soaked with water	Half of a litter is given to the cattle
Spiritual	Leave	Soaked with water	Sprinkled at the home of the household and local drink house
Cleaning	Leave	Boiled with various herbs	Washing home utensils and local jars. Washing early mothers who gave birth.

Besides treatment of infectious diseases, the leaves are used by local people for protection and treatment of communicable sexually transmitted diseases. The traditional healer also elicited that the remedy is also used under normal conditions to protect against the risk of contagious diseases mainly transmitted through sexual intercourse. A dermal disease called scabies which is caused due to an insect bite and leprosy due to bacterial infection is treated and cured by herbal medicine made of *sensel*. The dose of the medicine is not determined rather it is based on the amount of the affected area of the dermis and applied until the skin regains its natural look. Informants of the study areas portrayed that the *sensel* plant is highly effective to treat rabies disease among domestic animals which are caused by viral infection due to the bite of infected animals. The plant is used both for protective and curative purposes. When there is a suspicion of rabies infection among the localities, people used to provide the remedy

plant to the domestic animals because it is believed that *sensel* plant has anti-rabies treatment. However, if there is a certain condition of rabies infection among the domestic animals, the herbal medicine made of *sensel* is given to the affected animals within three days. The informants suggested that fresh milk has the role of reducing the acidic nature and the unpleasant smell of the remedy.

DISCUSSION

According to the informants, the plant is also used to treat cattle diseases for instance wounds and swelling appear inside the mouth of livestock. *Sensel* plant had also been used for the ritual aspects among the society for a long period of time. As respondents have evidenced that the society had been perceived and suggested that the *sensel* plant has the power of protection from the evil spirit like a spirit against the wealth and healthy wellbeing of peoples.

This has been practiced in two ways; the leave of *sensel* plant crushed and mixed with water then sprinkled in the living home and traditional alcohol drink houses like ‘*tela bet*’ and ‘*tej bet*’. The second way of protecting from the bad spirit is by planting the *sensel* plant along the living quarters as fencing. However, such activities are declining recently due to the propagation of religious teaching and considering backward practices among the community. The plant is used for cleaning kitchen materials (utensils) and maintaining the good health of the woman’s skin. The big clay jar (*insira*) which is used for fermentation and preparation of local beer (*tela*) is cleaned using the leave of *sensel* plant. According to informants, the plant keeps the flavor, a test of the drink and neatness of the jar as well. When a woman gives birth on the fifth day of her birth leave and rest, traditionally the baby mother showering event called *sheneni* is hosted. For such events, various medicinal herbs were collected and boiled with water. Thus, the sunset plant leave is highly selected and used as medicinal leave along with other herbs. Because the plant is believed that it has both spiritual roles to protect the mother against evil spirit and regains the skin and exhausted body of the baby mother.

Generally, according to the indigenous knowledge of the study area, the *sensel* plant has been used for medication and non-medication purposes. However, the dosage of the remedy is mostly determined by the physical maturity and age of the user rather than the chronic level of the disease. Thus, to manage the over dosage effect and associated contradiction and effect of the medication the traditional healer used to give milk and coffee along with the medication.

According to the informants’ local knowledge in the study area, the *Justicia schimperiana* plant was traditionally used for the treatments of different diseases such as Hepatitis B (*ye wef beshita*), Bronchial asthma, Contagious diseases, Abdominal illness, Dermal disease, Rabies, Livestock disease. These findings were in line with other studies which were done before by different researchers in separate study areas in Ethiopia. Subsequently, *Justicia schimperiana* is used in the treatment of various ailments such as asthma and other inflammatory situations, excessive pellagra, and constipation (Yinebeb, 2008); gonorrhoea, rabies (Tolera, 2017). Hepatitis B treatment (Haile *et al.*, 2008), for diarrhoea treatment and also reported that the plant is used in the treatment of livestock ailment (blackleg) and internal parasites (Teklehaymanot and Giday, 2007). In addition, *Justicia schimperiana* is used to treat malaria and gonorrhoea in southern Ethiopia also indicating that the leaf and root of *Justicia schimperiana* are used in the treatment of rabies and coccidiosis in western Ethiopia (Tadesse and Dereje, 2015). *Justicia schimperiana* is used to treat skin lesions in Shinasha, Agew-awi and Amhara peoples in northwest Ethiopia (Giday *et al.*, 2007). Furthermore, its fresh root is used to treat diseases in emergencies; the fresh leaf of *Justicia schimperiana* is used to treat rabies in Fiche District, Central Ethiopia (Abiyu, 2014).

CONCLUSION & RECOMMENDATIONS

Justicia schimperiana (Sensel) is an evergreen plant and grows in different parts of Ethiopia mostly as an unmanaged and managed plant. In most parts of the country, people use the plant for medicinal purposes and to fence their compounds. Based on the finding of this study, the community mainly those who are of low

economic status and people who have failed to be healed by modern medication from their health problems re-laid on an indigenous herbal remedy medication like *sensel*. Accordingly, the *sensel* plant is used to prepare a remedy for human and animal diseases like rabies, hepatitis, skin diseases, communicable diseases, asthma, malaria, abdominal illness / disorders, livestock diseases, and other human-related spiritual problems.

It would be important to save the plant populations in different regions to limit population decline caused by large-scale environmental catastrophes. The species or at least a large part of its genetic diversity may be lost soon due to its medicinal and other uses, urbanization, and its consequent exploitation if proper conservation measures are not adopted. The government and the stakeholders in the respective field should give due consideration to the ethnobotanical studies. Thus, indigenous knowledge on medicinal plants in general and *sensel* plants in particular should be widely investigated and documented at various levels from the locality to higher research institutions in the country. To conserve the plant and to avoid the risk of endangerment of the plant in future, the *sensel* plant should be conserved or planted along with other medicinal plants in the home garden of households, species, and genetic conservation sites like the institute of national

biodiversity. Under the current launched national green environment campaign and indigenous nursery afforestation, medicinal plants like *sensel* should also be planted along with the nurseries of trees. Consequently, it sustains the diversity of the *sensel* species and maintains the natural aspects of the ecosystem.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

The data supporting the conclusion of this article are included within the article. Any queries regarding this data may be directed to the corresponding author.

Declaration of interest

The authors declare no conflict of interest.

Acknowledgements

The author would like to forward heartfelt gratitude to the study subjects for their willingness to participate in our study. I use this opportunity to thank Hawassa University, the School of Plant and Horticulture Sciences, Department of Biotechnology for their material assistance and encouragement.

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