Traditional knowledge and medicinal practices related to the use of Wild Olive (*Olea europaea* subsp. *cuspidata*) in Central Ethiopia: An ethnobotanical perspective

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Research

Abstract

Background: Wild olive (*Olea europaea* subsp. *cuspidata*) is widely cultivated across the Middle East and Africa due to its many uses. This present study aimed to explore traditional knowledge and medicinal practices surrounding *O. europaea* subsp. *cuspidata* in Central Ethiopia.

Methods: Data were collected between June 2023 and August 2024 using quantitative and qualitative techniques, involving 1,567 respondents from indigenous communities across five zones and two districts. Purposive sampling was employed to select key informants. A semi-structured questionnaire was used to gather data on the medicinal uses of *O. europaea* subsp. *cuspidate* and knowledge transfer practices. Various ethnobotanical indices were calculated.

Results: The results showed that most (71.6%) of the respondents believed that *O. europaea* subsp. *cuspidata* extracts cure diseases. The most frequently used plant parts were bark (32.3%) and leaves (28.9%). Regression analysis indicated that ethnobotanical indices, such as RSI and UR significantly influenced Cultural Value ($p < 0.01$). Education level showed a negative association, particularly among those with no formal education (AOR = 1.60, 95% CI: 1.20–2.30, $p = 0.005$), while occupation was another significant factor, with farmers (AOR = 1.75, 95% CI: 1.25–2.45, $p = 0.005$) and local healers (AOR = 1.60, 95% CI: 1.10–2.30, $p = 0.015$) being more likely to use *O. europaea* subsp. *cuspidata* knowledge.

Conclusions: The study found *O. europaea* subsp. *cuspidata* is valued for treating backaches and elevated blood pressure. Knowledge transfer primarily occurred within families and bark was the plant tissue most frequently used.

Keywords: Wild olive, Central Ethiopia, Traditional Knowledge, Medicinal Practice, Ethnobotanical

Background

Ethnobotany has long been recognized as a vital field for understanding the dynamic relationship between indigenous cultures and the natural environment (Garnatje *et al*. 2017). In particular, medicinal plants hold a special place in many societies, serving as both cultural symbols and practical, available remedies for various ailments (Ansari 2021; Castañeda *et al.* 2022). The wild olive tree (*Olea europaea* subsp*. cuspidata*) is native to parts of Africa and the Middle East (Fanelli *et al*. 2022). According to the Royal Botanical Gardens (https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:77190043-1), this subspecies is synonymous with 12 other species or subspecies of wild olives, including those found in the Himalayas and China. This plant has been used for centuries across diverse communities for its medicinal, cultural, and ecological value (Elhrech *et al*. 2024; Hashmi *et al*. 2015).

In Ethiopia *O. europaea* subsp*. cuspidata* plays a prominent role in traditional medicine and is deeply embedded in the socio-cultural fabric of rural and indigenous communities (Kassa *et al*. 2019). The highlands of Central Ethiopia with their unique ecological zones, provide an ideal setting for the study of ethnobotanical practices surrounding *O. europaea* subsp*. cuspidata*. In this region, traditional healers, farmers, and traditional spiritual leaders, including spiritual persons of Catholic, Protestant and Muslim faith, have preserved and passed down valuable knowledge on the medicinal uses of plant extracts for the treatment of various ailments, ranging from respiratory issues to skin disease and digestive disorders (Asfaw *et al*. 2022). Despite the wealth of indigenous knowledge, this body of knowledge faces significant threats due to environmental degradation, overharvesting, and the gradual loss of oral traditions. As modern healthcare systems become more accessible, younger generations may also be less inclined to engage in these traditional practices, leading to a decline in the transmission of ethnobotanical wisdom (Abera 2014)]. This potential loss is of particular concern as many of these remedies have not been thoroughly documented or scientifically validated, posing risks to both cultural heritage and biodiversity.

It is worth noting that at least 50% of “modern” medicines are based on compounds derived from traditional medicinal sources, so the loss of traditional knowledge has an impact on future pharmaceutical innovation as well (WHO 2023). The study aimed to document the traditional knowledge and medicinal practices associated with *O. europaea* subsp*. cuspidata* in Central Ethiopia, focusing on the perspectives of local healers, spiritual leaders, and resource persons. The specific objectives were to explore the medicinal applications of *O. europaea* subsp*. cuspidata* and assess the current mechanisms of knowledge transmission, as well as to identify the challenges facing its preservation.

Materials and Methods

Study design

We used quantitative and qualitative techniques to collect comprehensive data from indigenous communities from June 2023 to August 2024. The target population included traditional healers, village resource persons, farmers, and spiritual leaders. Traditional healers are individuals with extensive knowledge of local medicinal practices and plant-based treatments, often regarded as the community’s health experts. Village resource persons are experienced members of the community who share valuable insights and connect past wisdom with present practices. Farmers are key contributors to the local economy, with hands-on experience in agriculture and knowledge of plant cultivation, including the use of wild olives. Spiritual leaders, from diverse religious backgrounds such as Catholic, Protestant, and Muslim, guide their communities in spiritual practices and hold cultural influence, contributing significantly to traditional knowledge.

A purposive sampling was used to select key informants with extensive knowledge of wild olive use. A total of 1,567 respondents were involved in the study. The sample size was calculated using the power formula; $n = \hat{p}\hat{q}\left[\frac{Z_{\alpha/2}}{\epsilon}\right]^2$ (Schmidt *et al*., 2018). Where n, $\hat{p}$, $Z_{(\alpha/2}$, and € represent sample size, sample proportion, confidence interval and margin of error respectively, and $\hat{q}$ is 1- $\hat{p}$. A 5 % non-response rate was considered while validating the final sample number.

Study area

The study was carried out in multiple rural and peri-urban areas of Central Ethiopia including Hadiya, Kambata, Gurage, Silte, Yem Zones as well as the districts of Tembaro, and Mareko (Figure 1). Specifically, data was collected from Fofa, Toba and Deri districts of Yem zone; Gibe, Duna, Soro, and Siraro Badeacho of Hadiya zone; Doyogena, Hadero-Tunto, Damboya and Kachabira of Kambata zone; Cheha, Ejah, and Inor-Ener of Gurage zone; Mirab Azernet, Alicho Weriro and Sankura of Silte zone; and Tembaro and Mareko special districts. Geographically, central region lies between latitudes 8° and 10° N and longitudes 37° and 39° E. The region is characterized by a combination of highland plateau and lowland areas, with elevations ranging from 1,500 meters to over 3,000 meters above sea level. Temperatures ranged from 16°C to 20°C throughout the year. Rainfall is bimodal, with the main rainy season “Kiremt" occurring from June to September and a smaller rainy season

"Belg" from March to May. The primary economic activities in the region are agriculture and animal husbandry. Small-scale farmers cultivate staple crops such as teff (*Eragrostis tef*, also referred to as William's lovegrass), barley, and wheat, while livestock provide a crucial source of income. The region has rich biodiversity, with a variety of endemic plant species. The wild olive (*O. europaea* subsp. *cuspidata*) tree is found in home gardens, open fields, monasteries, old churches, and forested and semi-forested areas within the region and is of particular ethnobotanical importance due to its widespread use in traditional medicine. The study districts were selected based on the prevalence of wild olive trees and the presence of local healers, farmers, and community elders who possess traditional knowledge on medicinal practices.

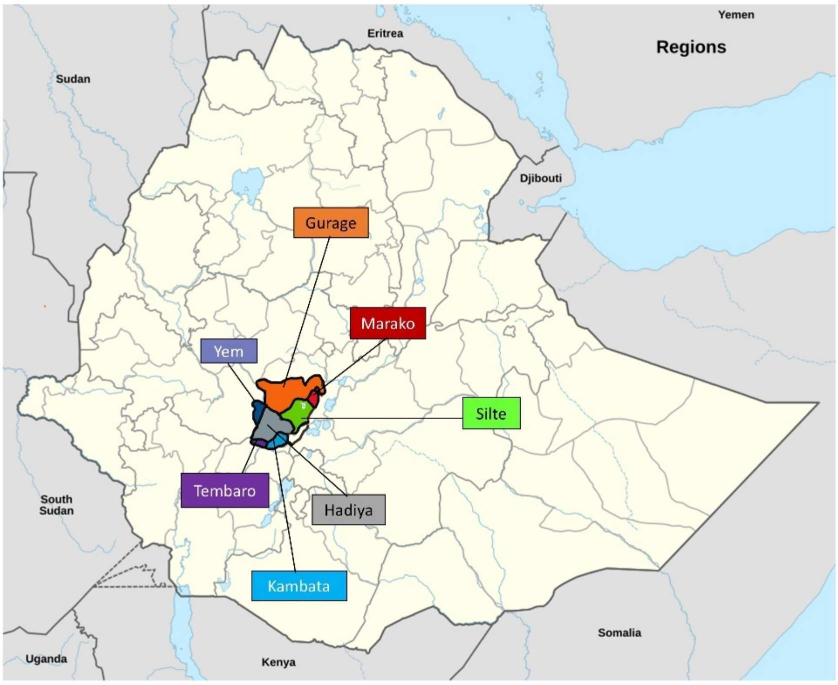

Figure 1. The study area locations are shown on the map with labels indicating the specific study sites.

Data Collection

A semi-structured questionnaire was used to collect data on socio-demographic characteristics, the medicinal use, and traditional knowledge-transfer practices. The questionnaire had both closed- and open-ended questions. Unstructured interviews were also conducted to gather the information from the respondents. All questionnaire responses, along with personal details such as name, ethnicity, religion, and other information provided by the study participants, were kept confidential and anonymity of the respondents was maintained throughout the study. The study was approved by the University's Research Ethics Committee (Ref. No IRBCA/08/16). The key informants were informed about the aim of the study and informed consent was obtained from all the study participants.

Various ethnobotanical tools, including Rahman's Similarity Index (RSI), Use Report (UR), Frequency of Citation (FC), Number of Uses (NU), Cultural Importance (CI), Relative Frequency of Citation (RFC), Cultural Value (CV), Use Value (UV) and Relative Importance (RI), were employed to assess the traditional knowledge and medicinal practices related to *O. europaea* subsp. *cuspidata* (Ralte *et al*. 2024; Reyes-García *et al*. 2006; Bennett & Prance 2000; Tamene *et al*. 2024; Alemu *et al*. 2024). The following formulae were used to determine these indices:

$$RSI = \frac{C}{A + B - C}$$

where *RSI* is Rahman's Similarity Index, *C* is the number of species or uses shared by two ethnic groups, and *A* and *B* are the total number of species or uses mentioned by each group individually.

$$UR = \sum(UR_i)$$

Where *UR* is Use Report, UR_i is the number of use reports for a specific plant by informant *i*.

$$NU = \sum U_c$$

Where NU is Number of Uses, U_c is the number of distinct use categories.

$$CV = \sum \left(\frac{FC_u}{N}\right) \times \frac{NU_i}{T}$$

Where CV is Cultural Value, FC_u is the frequency of citation for a given use, N is the total number of informants, NU_i is the number of uses reported for a plant species by each informant, is the total number of uses for all plants combined.

$$RI = \left(\frac{N_u}{N_t}\right) + \left(\frac{N_p}{N_q}\right)$$

Where RI is Relative Importance, N_u is the number of use categories reported for a plant, N_t is the total number of use categories considered in the study, N_p is the number of informants mentioning a given plant species, N_q is the total number of informants.

$$FC = \frac{Number\ of\ informants\ who\ mentioned\ the\ plant}{Total\ number\ of\ informants}$$

Where FC is Frequency of Citation.

$$CI = \sum \frac{U_s}{N}$$

Where CI is Cultural Importance Index, U_s is the number of use categories for each plant species, and N is the total number of informants.

$$RFC = \frac{FC}{N}$$

where RFC is Relative Frequency of Citation, FC is the frequency of citation and N is the total number of informants.

$$UV = \frac{\sum U_i}{N}$$

where UV is Use Value, U_i is the total number of uses mentioned by each informant, and N is the total number of informants.

Data Analysis

The data were cleaned and entered into MS excel. The SPSS V27.0 and ethnobotany R package V0.1.8 was employed for both qualitative and quantitative data analysis. Regression analysis was carried to identify and quantify the demographic factors that influence the knowledge use of *O. europaea* subsp. *cuspidata* among different categories of study participants. Adjusted and unadjusted odds ratios (OR) and their 95% confidence intervals were used as indicators of the strength of association between different variables. A p-value <0.05 was considered a cut-off level for statistical significance. Potential biases were mitigated by choosing a diverse sample. To minimize response bias, questions were carefully framed in a neutral manner. Recall bias was addressed through follow-up questions and probing techniques during the interviews. Potential confounders were controlled using multivariate regression.

Results

The study included a total of 1,567 respondents, of whom 57.6% were male (n = 902) and 42.4% were female (n = 665) (Table 1). The respondents were categorized into different age groups, with 18.8% aged between 20-30 years, 28.5% in the 31-40 age group, 25.8% aged 41-50, 16.7% aged 51-60, and 10.2% aged 61 and above. Regarding education levels, 25.8% of the respondents had no formal education, 33.6% had completed primary education, 24.2% had completed secondary school, and 16.4% had university or college-level education. Occupational distribution revealed that 43.3% of the respondents were farmers, 6.3% were health professionals, 24.0% were traditional healers, 8.6% were forestry operators, 3.6% were state agents, and 14.2% were engaged in other occupations. The ethnic composition of the respondents included Gurage (17.7%), Hadiya (20.7%), Kambata (15.6%), Silte (13.1%), Yem (9.5%), Tembaro (7.0%), Marako (5.7%), and others (10.5%). In terms of informants' categories, village resource persons constituted 34.9% of the participants, while 14.0% were middlemen or interpreters, 23.9% were traditional healers, 8.4% were local forest officers, 9.7% were spiritual leaders, and 9.1% fell into other categories. Religion-wise, 34.4% of the respondents were followers of Ethiopian Orthodox Christianity, 47.4% were Protestants, 11.5% were Muslims, and 6.7% practiced other religions. The experience of traditional healers showed that 44.4% had 1-10 years of experience, 24.4% had 11-20 years of experience, 22.1% had 21-30 years of experience, and 9.1% had more than 31 years of experience. Most respondents (78.1%) were born in rural areas, while 21.9% were born in urban areas. All the demographics and their respective values are summarized in Table 1.

Table 1. Demographic attributes of the respondents and their corresponding frequencies and percentages

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	902	57.6%
	Female	665	42.4%
Age Group	20-30	295	18.8%
	31-40	446	28.5%
	41-50	405	25.8%
	51-60	261	16.7%
	61 and above	160	10.2%
Education Level	No formal education	404	25.8%
	Primary	527	33.6%
	Secondary school	379	24.2%
	University/College	257	16.4%
Occupation	Farmer	678	43.3%
	Health professional	98	6.3%
	Traditional healer	376	24.0%
	Forestry operator	134	8.6%
	State agent	56	3.6%
	Other	225	14.2%
Ethnic Group	Gurage	278	17.7%
	Hadiya	325	20.7%
	Kambata	245	15.6%
	Silte	206	13.1%
	Yem	149	9.5%
	Tembaro	109	7.0%
	Marako	90	5.7%
	Other	165	10.5%
Informants’ Category	Village resource persons	546	34.9%
	Middlemen or interpreter	219	14.0%
	Traditional healer	376	24.0%
	Local forest officers	131	8.4%
	Spiritual leaders	152	9.3%
	Other	143	9.1%
Religion	Ethiopian Orthodox	539	34.4%
	Protestants	742	47.4%
	Muslim	243	15.5%
	Other	43	2.7%
Years of Experience as Traditional Healer	1-10 years	167	44.4%
	11-20 years	92	24.4%
	21-30 years	83	22.1%
	31 years and above	34	9.1%
Place of Birth	Rural	1,224	78.1%
	Urban	343	21.9%

The study revealed that 71.6% of respondents agreed that Ethiopian *O. europaea* subsp. *cuspidata* extracts cure diseases, while 15.5% did not agree, and 12.9% were unsure (Figure 2).

Among the participants, 43.3% reported using wild olives or their parts to treat diseases, while 56.7% indicated they had not. The most common ailments treated with wild olive were backaches (192 respondents), elevated blood pressure (145 respondents), coughs (123 respondents), wounds (156 respondents), and eye infection (62 respondents), with smaller numbers reporting its use for asthma and sinuses and other ailments such as headaches, helminthes, skin cancer, elephantiasis, and itchy rashes. In terms of diseases treatable by wild olives within the community, 25.9% of respondents indicated backaches, 18.7% cited elevated blood pressure, and 15.6% mentioned its use for treating wounds as a styptic (meaning a substance that stops bleeding). Other-conditions included asthma and blocked sinuses (12.9%), bloody stool (indicating rectal bleeding) and diarrhoea (10%), and malaria (15.2%), with smaller proportions mentioning treatment of ailments such as bone fractures, mental illness, skin cancer, elephantiasis and placental retention after giving birth.

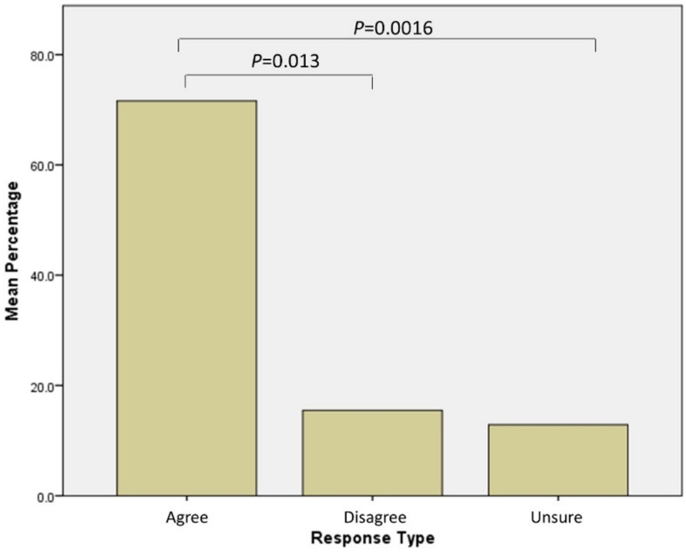

Figure 2. Respondents perception on the effectiveness of curing diseases by *O. europaea* subsp. *cuspidata*.

Regarding the plant parts used, 32.3% of participants reported using scraped bark, 14.2% used the leaf, 3.0% used stem, 2.9% used the fruit while 47.6% used other parts of the plant. For preparation, 33.4% of respondents prepared the wild olive through boiling or cooking, followed by crushing or powdering (26.5%) and tea making (18.3%) (Figure 3). Use of exudates and distillation were less common methods. Over half (53.3%) of the respondents stated that wild olives were more effective when harvested during the dry season. The most common routes of administration were oral (52.5%) and application of dermal creams (21.2%), while a smaller proportion used methods like inhalation, washing, brushing, and chewing. In terms of dosage adjustment, 47.5% of respondents adjusted the dose based on the patient's age, gender, or condition, while 27.6% did so sometimes, and 24.8% did not adjust dosage at all.

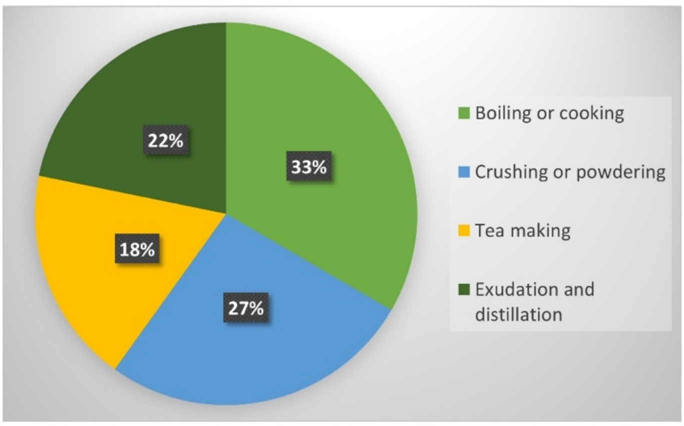

Figure 3. Methods of preparation of wild olive as reported by respondents.

Regarding the sources of information on the use of *O. europaea* subsp. *cuspidata* for disease treatment, 52.5% of respondents gained their knowledge from family experience, while 15.3% attributed it to divine inspiration, 15.1% received it from community engagement, 0.7% through books or literature, and 8.4% don't know how they received the information. Only 5.9% cited media as their source of information. Healers primarily transferred indigenous knowledge to all family members (38.2%), followed by the eldest son (35.5%) and eldest daughter (26.4%). When asked about community-based efforts to protect *O. europaea* subsp. *cuspidata* trees, 43% of respondents reported that such efforts exist, while 57% said there were none. Additionally, 64% of respondents expressed concern that traditional knowledge about wild olives is being lost in their community, while 36% believed it was not.

The cost of treatment using *O. europaea* subsp. *cuspidata* remedies varied based on the ailment, generally ranging from free service to 50 Birr (1 USD = 57 Birr; conversion rate at the time of study) per session. For more complex ailments, such as bone-setting, the cost could reach up to 100 Birr. No charge was applied for minor ailments, particularly for community members. In terms of toxicity and secondary effects, most patients did not experience significant side effects. However, some reported mild stomach upset after consuming the olive extract.

The duration of treatment differed by ailment. Preparations for common conditions like coughs or headaches were taken for approximately 3 to 5 days (table). For chronic conditions such as high blood pressure, patients typically took the preparation for up to two weeks. Bone-setting treatments involved applying the paste daily for 2 to 3 weeks, depending on the severity of the fracture. Water was the most commonly used solvent, with honey occasionally added for oral preparations. Animal fat or butter was used as a base for certain skin treatments. Additional plants, such as Ruta (Rue), and Clove basil, were mixed with wild olive leaves to enhance effectiveness for treating headaches, and eye illnesses, respectively. Aloe vera was combined with olive bark for treating fractures and wounds. To treat cancer, a mixture of leaves from *Pycnostachys abyssinica* Fresen (known locally as "Tontona"), *Vernonia auriculifera* Hiern (known locally as "Barawa"), and *Crotalaria incana* L (known locally as "Chelka) was mixed with the bark of wild olive trees. Other ingredients, including honey, garlic, and ginger root, were used to sweeten or enhance preparations for specific conditions.

Table 2. Various ailments and the corresponding traditional methods of preparation using *Olea europaea* subsp. *cuspidata* for treatment

Ailment	Preparation Method
Asthma	The bark was scraped and boiled in water for 30 minutes. After cooling, the liquid was strained and given as a drink twice a day until the symptoms improved.
Backaches	The leaves were crushed into a fine powder and mixed with hot water. The mixture was applied topically to the affected area and left overnight. It was repeated daily.
High Blood Pressure	An infusion was prepared by soaking olive leaves in hot water for 10 minutes. The patient drank one cup twice a day for a week to regulate blood pressure.
Bone-setting	The bark was boiled, and the cooled liquid was used to wash the fractured area. A paste made from the leaves was applied, and the limb was bandaged.
Coughs	The olive fruit was mashed and mixed with honey. The mixture was taken orally, one tablespoon three times a day until the cough subsided.
Wounds (Styptic)	The bark was dried and ground into a powder, which was sprinkled on open wounds to stop bleeding and promote healing.
Eye Illness	Fresh olive leaves were crushed, and their juice was extracted. The juice was filtered and applied as eye drops twice a day for infections or redness.
Malaria	The leaves were boiled with other medicinal plants, and the resulting tea was consumed twice a day for three days.
Headaches	The olive leaves were crushed and made into a paste mixed with water. The paste was applied to the temples and forehead to relieve headaches.
Helminths	The roots of the olive tree were boiled, and the patient drank the liquid early in the morning on an empty stomach for three days.
Mental Illness	A decoction was prepared from the bark and leaves, which was consumed orally. Additionally, the patient inhaled the steam from the boiling mixture.
Retained Afterbirth	The root was boiled, and the mother drank the liquid to help with the expulsion of the retained placenta.
Cancer	The root bark was dried and crushed into a powder. It was taken in small doses mixed with honey to strengthen the patient.
Itchy Rashes	A paste was made from the leaves and applied directly to the affected skin twice a day until the itching subsided.

In terms of uses overall, the direct matrix ranking analysis placed medical uses in the highest rank, followed by fumigation in second place, and shade/ornamental uses in third position (Figure 4). Construction, household utensils, and farm implements were ranked fourth and fifth, respectively. The 'Others' category, which included cultural and religious uses, was ranked sixth, followed by tella (a traditional alcoholic beverage) in seventh and oil in eighth. Use of the tree in making charcoal was ranked ninth.

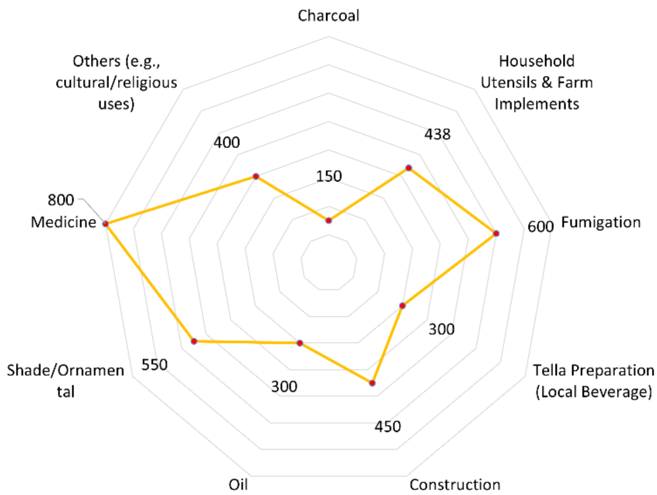

Figure 4. Direct matrix ranking of various uses of *Olea europaea* subsp*. cuspidata*.

There were also differences among ethnic groups in terms of some of the uses of *O. europaea* subsp*. cuspidata*, with medicinal and food-related uses being the most common across all groups. The Yem, Hadiya, and Kambata groups had the highest number of medicinal uses (seen as wider arrows in the Chord Diagram (Figureure 5), while other groups, such as the Tembaro, Gurage, and Marako reported fewer medicinal uses. Silte ranked fourth, so were intermediate in terms of medicinal uses. The chord diagram (Figure 5) illustrates these relationships, highlighting the connection between each ethnic group and the specific uses of wild olives that they reported.

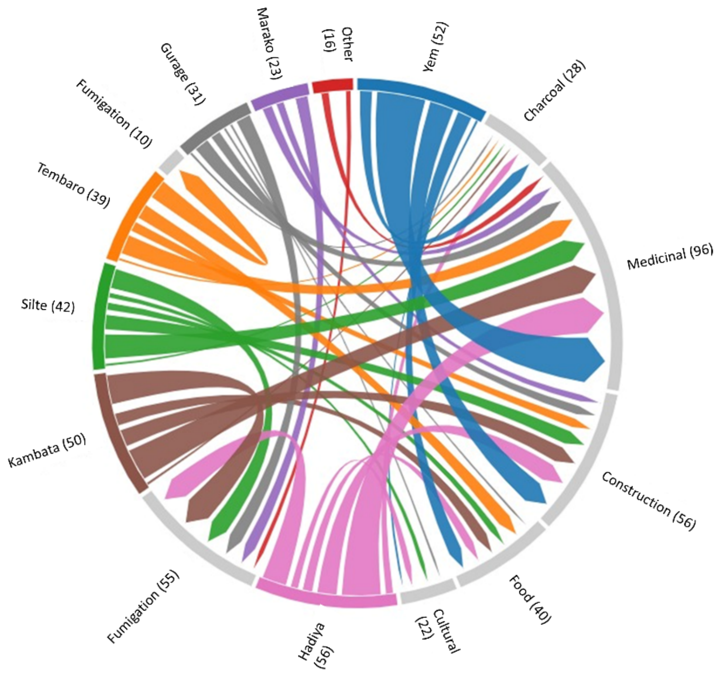

Figure 5. Chord diagram depicting the relationship between ethnic groups and use categories of Wild Olives.

The ethnobotanical indices differed among respondents across ethnic groups (Table 3). The RSI ranged between 0.45 and 0.54 indicating differences in the ethnobotanical knowledge shared among the groups. The UR for the groups ranges from 110 to 140. The FC ranged from 0.25 to 0.36. The NU ranged from 14 -22, suggesting variability in the number of distinct uses assigned to the plant species across different groups. CI values (reflecting the sum of the number of use categories divided by the number of informants) were relatively low across the study regions, ranging from 0.027 to 0.050. RFC and CV showed slight variations, with RFC ranging from 0.160 to 0.210, and CV values ranging from 0.58 to 0.72. The RI showed a similar pattern, ranging from 0.66 to 0.80 across the study regions.

Table 3. Ethnobotanical Indices. Rahman's Similarity Index (RSI), Use Report (UR), Frequency of Citation (FC), Number of Uses (NU), Cultural Importance (CI), Relative Frequency of Citation (RFC), Cultural Value (CV), and Relative Importance (RI) and Use Value (UV) for use of *Olea europaea* subsp. *cuspidata* across study groups.

Study site	RSI	UR	FC	NU	CI	RFC	CV	RI	Mean UV	Standard deviation of FC	CI (95%)	Range RFC
Gurage	0.48	120	0.29	18	0.032	0.185	0.65	0.72	0.115	0.05	0.27-0.31	0.18-0.29
Hadiya	0.52	130	0.32	20	0.045	0.192	0.68	0.78	0.130	0.04	0.30-0.34	0.19-0.31
Kambata	0.47	115	0.27	15	0.028	0.170	0.60	0.68	0.112	0.06	0.25-0.29	0.17-0.28
Silte	0.50	125	0.31	19	0.035	0.190	0.64	0.74	0.125	0.03	0.29-0.33	0.19-0.30
Yem	0.49	118	0.28	17	0.030	0.176	0.63	0.70	0.118	0.04	0.26-0.30	0.18-0.27
Tembaro	0.51	140	0.34	22	0.040	0.200	0.70	0.76	0.140	0.06	0.32-0.36	0.21-0.32
Marako	0.45	110	0.25	14	0.027	0.160	0.58	0.66	0.105	0.07	0.22-0.28	0.16-0.24
Others	0.54	135	0.36	21	0.050	0.210	0.72	0.80	0.145	0.05	0.34-0.38	0.20-0.34

A regression analysis was performed to identify and quantify the relationships between various ethnobotanical indices and the CV of *O. europaea* subsp. *cuspidata* (Table 4). The analysis revealed that RSI has a significant ($p<0.01$) positive impact on CV ($\beta = 0.25$, $p = 0.003$). UR also positively influences CV ($p<0.05$; $\beta = 0.05$, $p = 0.015$). FC demonstrates a significant effect on CV ($p<0.01$; $\beta = 0.20$, $p = 0.008$). Additionally, NU ($\beta = 0.10$, $p = 0.002$), CI ($\beta = 0.30$, $p = 0.002$), RFC ($\beta = 0.15$, $p = 0.015$), and RI ($\beta = 0.20$, $p = 0.008$) all significantly contribute to variations in CV. The model explains 85% of the variance in CV (R-squared = 0.85, $p < 0.01$) (Table 4).

Table 4. Regression analysis of cultural value. Rahman's Similarity Index (RSI); Use Report (UR); Frequency of Citation (FC); Number of Uses (NU); Cultural Importance (CI); Relative Frequency of Citation (RFC); Relative Importance (RI)

Variable	**Coefficient**	**Standard Error**	**t-Statistic**	**p-value**
Intercept	0.45	0.10	4.50	<0.01
RSI	0.25	0.08	3.13	0.003
UR	0.05	0.02	2.50	0.015
FC	0.20	0.07	2.86	0.008
NU	0.10	0.03	3.33	0.002
CI	0.30	0.09	3.33	0.002
RFC	0.15	0.06	2.50	0.015
RI	0.20	0.07	2.86	0.008
Model Summary				
R-squared	0.85			
Adjusted R-squared	0.82			
F-statistic	12.45			<0.01

Several demographic factors significantly influenced people's knowledge of uses for *O. europaea* subsp. *cuspidata* (Table 5). Males were more likely to report having used this knowledge compared to females (AOR = 2.50, 95% CI: 1.75–3.50, $p < 0.001$). Age also had a notable impact, with individuals aged 41–50 being more likely to use wild olive knowledge than younger groups (AOR = 1.40, 95% CI: 1.00–1.90, $p <0.05$). Education level showed a negative association, particularly among those with no formal education (AOR = 1.60, 95% CI: 1.20–2.30, $p<0.01$), while occupation was another significant factor, with farmers (AOR = 1.75, 95% CI: 1.25–2.45, $p<0.01$) and local healers (AOR = 1.60, 95% CI: 1.10–2.30, $p<0.05$) being more likely to use *O. europaea* subsp. *cuspidata* knowledge. Ethnic group also played a role, with the Hadiya ethnic group being significantly associated with higher knowledge use (AOR = 1.65, 95% CI: 1.10–2.50, $p<0.05$). Additionally, rural-born individuals were more likely to use wild olive knowledge compared to those born in urban areas (AOR = 1.40, 95% CI: 0.95–2.05, $p<0.05$).

Table 5. Regression Analysis of Factors Influencing Knowledge Use of *Olea europaea* subsp. *Cuspidate*.

Variable	Odds Ratio (95% CI)	p-value	Adjusted Odds Ratio (95% CI)	p-value
Gender				
Male	1.30 (1.05–1.58)	0.020	2.50 (1.75–3.50)	<0.001
Female	1.00		1.00	
Age Group				
20–30	1.10 (0.80–1.50)	0.150	1.20 (0.85–1.65)	0.055
31–40	1.00		1.00	
41–50	1.50 (1.10–2.05)	0.025	1.40 (1.00–1.90)	0.020
51–60	1.25 (0.85–1.75)	0.220	1.10 (0.70–1.60)	0.155
61 and above	1.05 (0.65–1.60)	0.520	0.90 (0.55–1.40)	0.415
Education Level				
No formal education	1.50 (1.10–2.10)	0.010	1.60 (1.20–2.30)	0.005
Primary	1.20 (0.90–1.60)	0.190	1.30 (0.95–1.75)	0.080
Secondary school	1.00		1.00	
University/College	0.85 (0.60–1.25)	0.420	0.95 (0.65–1.40)	0.345
Occupation				
Farmer	1.50 (1.10–2.05)	0.020	1.75 (1.25–2.45)	0.005
Health professionals	0.90 (0.50–1.60)	0.750	1.00 (0.55–1.85)	0.890
Local healers	1.40 (1.05–1.90)	0.030	1.60 (1.10–2.30)	0.015
Forestry operator	0.75 (0.45–1.25)	0.280	0.85 (0.50–1.45)	0.370
State agent	1.00		1.00	
Other	1.10 (0.75–1.55)	0.500	1.20 (0.80–1.75)	0.350
Ethnic Group				
Gurage	1.30 (0.95–1.75)	0.090	1.40 (1.00–1.95)	0.045
Hadiya	1.50 (1.05–2.10)	0.025	1.65 (1.10–2.50)	0.010
Kambata	1.10 (0.75–1.65)	0.580	1.20 (0.80–1.85)	0.400
Silte	0.95 (0.65–1.35)	0.760	1.00 (0.65–1.50)	0.990
Yem	0.80 (0.50–1.30)	0.430	0.90 (0.55–1.50)	0.640
Tembaro	0.70 (0.40–1.25)	0.210	0.85 (0.50–1.40)	0.530
Marako	0.75 (0.50–1.20)	0.250	0.80 (0.50–1.30)	0.420
Others	1.00		1.00	
Informants' Category				
Village resource persons	1.00		1.00	
Middlemen or interpreter	0.90 (0.60–1.40)	0.730	1.00 (0.65–1.55)	0.970
Traditional healer	1.50 (1.05–2.10)	0.030	1.65 (1.10–2.50)	0.010
Religion				
Ethiopian Orthodox	1.10 (0.80–1.50)	0.600	1.20 (0.85–1.70)	0.350
Protestants	1.00		1.00	
Muslim	1.55 (1.00–2.45)	0.050	1.70 (1.10–2.65)	0.020
Place of Birth				
Rural	1.25 (0.95–1.70)	0.080	1.40 (0.95–2.05)	0.030
Urban	1.00		1.00	

Discussion

The demographic profiles of the respondents in this study show the diverse socio-cultural composition of the population involved in traditional knowledge practices related to *Olea europaea* subsp. *cuspidata*. The gender distribution that shows a higher proportion of males (57.6%) than females are aware of medicinal uses of this plant suggests potential gender dynamics in the sharing and transmission of ethnobotanical knowledge, although studies in other parts of the world show matrilineal transfer, particularly in relation to plants used in treatments related to pregnancy and birth (Keshet and Simchai, 2014). This "male-biased" trend has, however been observed in previous ethnobotanical studies in Ethiopia (Tamene *et al*. 2024; Tadesse *et al*. 2024; Tefera *et al*. 2019). Likewise, in our study we found that middle-aged individuals (41-50 age range) possess more knowledge and awareness regarding the use of wild olives. This is likely because this group is considered the most active group in terms of knowledge retention and dissemination. However, the relatively lower representation of younger individuals (18.8% aged 20-30) indicates a declining interest in these practices among the youth. A similar trend is often observed in communities transitioning to modern healthcare systems (Wassie *et al*. 2015). Many studies suggest that individuals aged 50 and above possess greater knowledge of traditional medicine compared to those in younger age groups (Grzywacz *et al*. 2008; Tom *et al*. 2007; Tangkiatkumjai *et al*. 2020; Panossian *et al*. 2021). The influence of globalization and modernization often results in a preference for allopathic ("Western") medical practices over traditional ones. This preference is further reinforced by the lack of institutional support for traditional knowledge systems. However, it's important to note that this observation is not universal. There may be regions or communities where younger individuals actively participate in traditional practices, including the use of wild olives. The educational background of users varied, with over a quarter of respondents lacking formal education. This reflects a strong reliance on oral traditions for knowledge transmission. Nonetheless, the presence of a significant number of individuals with primary (33.6%) and secondary (24.2%) education suggests that formal literacy in these communities could be used to aid in the documentation and preservation of traditional practices. The low knowledge level of the relatively smaller group with university or college education (16.4%) indicates that such higher education may be associated with a shift away from traditional knowledge systems (Zidny *et al*. 2020). Farmers and traditional healers make up the bulk of the respondents, which indicates the close connection between agricultural livelihoods and the use of medicinal plants. Traditional healers, in particular, are key custodians of medicinal knowledge, and their significant presence in the respondent pool highlights their major role in maintaining traditional health practices. Bhat et al. (2021) conducted a study on the knowledge of various medicinal plants in the Himalayan range of Jammu and Kashmir, India. They concluded that local people, particularly those involved in medicinal practices, possess the highest level of knowledge about medicinal plants compared to other groups. Similarly, studies by Eisenberg et al. (1998) and Ni et al. (2002) found that local individuals involved in the preparation of traditional medicinal concoctions tend to possess greater knowledge of traditional medical practices. The ethnic diversity, religious composition and the proportion of respondents born in rural areas, intersect with traditional medicinal practices. Different groups or individuals are likely to maintain unique knowledge systems and medicinal practices, shaping how wild olive plants are used in their communities. Cultural background plays a significant role in the preservation and transmission of ethnobotanical knowledge (Bharucha *et al*. 2010; Yineger & Yewhalaw 2007). Our study yielded results that support these observations.

A majority of respondents (71.6%) affirmed that extracts from the wild olive can cure diseases, aligning with studies such as Giday et al. (2009), which documented the use of wild olive in treating various ailments in Ethiopia. However, a smaller proportion (15.5%) did not agree, and 12.9% were unsure, suggesting that while the plant's medicinal value is widely recognized, there remains some scepticism or lack of knowledge, possibly due to differences in cultural knowledge transmission, accessibility, or the influence of modern medical practices. Given the diverse medicinal properties of *Olea europaea* subsp. *cuspidata* we found that the majority of the respondents cite it for treating ailments like asthma, eye diseases, and helminthic infections, while backaches, elevated blood pressure, wounds, and coughs were the most frequently cited ailments treated with wild olives. This is consistent with Teklehaymanot and Giday (2007), who reported its similar uses in treating various ailments including musculoskeletal pain and respiratory issues in Ethiopia. The relatively smaller number of respondents reporting its use for sinuses, helminthes, skin cancer, elephantiasis or itchy rashes reflects regional variations in medicinal practices or availability as reported by Kidane et al. (2014), who found variability in the use of medicinal plants based on ecological zones and cultural traditions. While this study corroborates much of the existing literature on the medicinal uses of wild olive, the variability in responses regarding its efficacy and the ailments it treats suggests a need for further investigation into regional and individual differences in knowledge. Factors such as knowledge transmission and environmental factors may play a role in these discrepancies, as suggested by Parween et al. (2022), who noted that traditional knowledge often varies significantly based on these factors.

Medicinal constituents of plants vary in concentration in different plant tissues. As a result, different parts are utilized for their medicinal properties. In our study, a significant portion of respondents reported using the bark (32.3%) and leaves (28.9%) for medicinal purposes. This finding aligns with previous studies, which often identify these parts as the most used due to their higher concentrations of active compounds and relatively simple preparation methods (Zschocke *et al*. 2000; van Wyk 2008; Ndhlala *et al*. 2022). Common preparation techniques, such as boiling, crushing, and tea-making (infusions), were widely practiced in our study. These methods are designed to suit the routes of administration, with oral (52.5%) and dermal (21.2%) being the most prominent, consistent with findings from other studies on medicinal practices (Jin *et al*. 2015; Kahraman *et al*. 2020).

We observed the multifunctional importance of *Olea europaea* subsp. *cuspidata* in the local community, with a clear preference for medicinal and fumigation applications, followed closely by its use as a shade/ornamental tree. Informants prioritizing fumigation and medicinal uses of *Olea europaea* subsp. *cuspidata* were particularly evident in our study. This aligns with previous research that underscores the medicinal significance of wild olives in African and Middle Eastern cultures (Karimi *et al*. 2015; Yiblet Adamu 2023; Aziz *et al*. 2018; Motti 2022). The various health benefits of *Olea europaea* subsp. *cuspidata* are well known, as discussed earlier. Oil usage was ranked eighth despite its significant dual benefits, serving both dietary and therapeutic purposes. It remains an essential component in both medicinal and culinary practices (Abera & Belay 2022). The absence of oil extraction technology and resources in the study area has limited its broader application as an oil, particularly when compared to its other uses. The lower ranking of such uses as fuel, household utensils, and farm implements suggest that although wild olive wood is used for these purposes, it is less central compared to its medicinal and fumigation roles. This finding is consistent with Hashmi et al. (2015), who noted that while the wood of *Olea europaea* is durable and valuable for construction and crafting, its role in local economies is often secondary to its medicinal and cultural uses. Other applications, such as charcoal production, *tella* (an alcoholic drink) preparation, and cultural and religious uses, though ranked lower in our study, have been shown to have various rankings in other studies (Fanelli *et al*. 2022; Espínola *et al*. 2021; Baccouri *et al*. 2021). Though our results may not entirely align with findings elsewhere, it is important to recognize that the use of *Olea europaea* subsp. *cuspidata* is often need-specific or culturally specific. However, we have not validated this aspect in our study.

Traditional practices involving medicinal plants vary across ethnic groups, with medicinal and food-related uses being the most frequently reported. The Yem and Hadiya communities, in particular, exhibited a broader range of medicinal uses, reflecting their greater ethnobotanical knowledge and stronger dependence on this species. In contrast, respondents from the Gurage, Tembaro, Marako, and Silte communities reported fewer uses, which may indicate regional and ethnic group differences in the plant's utilization or disparities in traditional knowledge. Cultural diversity significantly influences the applications of the plant (Salgotra & Chauhan 2023). Studies also suggest that geographical and social factors shape how different communities engage with ethnobotanical resources [Santoro *et al*. Estrada-Castillón *et al*. 2021; Tadesse *et al*. 2024).

Conclusion

Clearly, this tree holds a prominent place in the health and cultural practices of the local communities, particularly among traditional healers, farmers, and traditional spiritual leaders. Of respondents, 71.6% affirm the medicinal value of wild olive extracts, and a significant portion of the population actively use them to treat ailments such as backaches, high blood pressure, and wounds, so the importance of this plant is clear. Future research should focus on scientifically validating the medicinal properties of extracts of *O. europaea* subsp. *cuspidata*, with potential for broader application in modern medicine and sustainable development.

Declarations

List of abbreviations: UR - Use Report; RSI - Rahman's Similarity Index; FC - Frequency of Citation; NU - Number of Uses; CI - Cultural Importance; RFC - Relative Frequency of Citation; CV - Cultural Value; UV - Use Value; RI - Relative Importance; OR - Odds ratios

Ethics approval and consent to participate: The study was approved by the Hawassa University's Research Committee (Ref. No IRBCA/08/16). All participants involved in this study were informed about the purpose, procedures, and potential outcomes of the research. Written consent was obtained from each participant. The participants were given the option to withdraw at any time without consequence

Consent for publication: All participants consented for this publication

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