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Ethnobotanical Use and Diversity of Medicinal Plants in Zana and Laelay Koraro Woredas, Ethiopia

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Abstract

A study on the diversity and ethnobotanical uses of medicinal plants was conducted in Zana and Laelay Koraro Woredas, in Northwestern Tigray, Ethiopia, in December 2023. The study used ethnobotanical techniques like informant consensus, field observations, semi-structured interviews, ranking and both purposive and stratified sampling methods. In both woredas, a total of 117 medicinal plant species were identified, representing 53 families and 93 genera. The Fabaceae (11.11%), Solanaceae (6.8%), and Euphorbiaceae (4.3%) families were the most commonly used medicinal plants. The most prevalent growth forms were shrubs (35%), trees (33%), and herbs (26%). With 37.6% of the plant, leaves were the most commonly used part, followed by roots (22.8%) and seeds (8.7%). Internal application accounted for 61% of herbal preparations, with 39% of the remainder being used externally. *Acaia Lehai* is the most endangered medicinal plant, primarily due to agricultural expansion. *Lepidium sativum* is the preferred remedy for treating febrile illnesses. The study revealed a strong and significant positive correlation between the age of healers and their familiarity with medicinal plants ($p < 0.01$, $r = 0.7$) and a weak negative correlation between knowledge of these plants and educational attainment. According to the study, the availability of plant-based medications and their link to medical knowledge have been crucial in maintaining a wide variety of medicinal plant species. Patchy forests are essential hotspots for these plants, providing important information for pharmacological and phytochemical research as well as useful resources for healers. To promote conservation and sustainable forest management, it is essential to ensure that future generations respect and continue to utilize traditional medicine. Educating the use of medicinal plants and how local elders treated for youths are fundamental for the development of modern medicine and pharmacological results.

Keywords: traditional knowledge, biodiversity, ethno botany, sustainable

Introduction

Ethnobotany explores the relationship between plants and humans, focusing on how people utilize plants, as noted by Martin (1995) and the WHO (2003). Plants remain essential to life, serving as a vital source of medicine (Dery *et al*., 1999). Beyond their medicinal value, ethnobotanical studies also examine healing practices and cultural beliefs related to illnesses and treatments (Balick *et al*., 1996; Cotton, 1996; Asfaw *et al.,* 2007). It is estimated that throughout history, medicinal uses have been attributed to between 35,000 and 70,000 plant species. This medical tradition remains prevalent across Asian regions such as Hong Kong, Korea, Indonesia, and Malaysia, largely because 80 percent of its remedies are sourced from higher plants. Comparable practices exist in countries like Nepal, India, Bangladesh, Pakistan, and Sri Lanka (Husain, 1991). Ethiopia, characterized by its diverse landscapes, numerous ethnolinguistic groups (Tesema, 1993; Demisse, 2001; Kassu, 2004), and rich ecosystems (Breitenbach, 1963), has a long history of utilizing various higher plants for medicinal purposes over thousands of years.

In contemporary times, increasing attention is given to the chemical and genetic attributes of these plants to enhance human health (Gerique, 2006). Additionally, research by Teklehaymanot and Gidey (2007) indicates that approximately one quarter of modern pharmaceuticals are derived from medicinal plant extracts, with over 50,000 angiosperm species currently employed for therapeutic purposes. According to the World Health Organization (WHO, 2001), traditional medicine encompasses ancient, culturally rooted healing practices that differ from conventional scientific medicine and are often known as indigenous, alternative, or folk medicine. These practices largely rely on orally passed knowledge shared among diverse cultural communities.

A significant majority of the global population between 70 and 90 percent depends on plant-based remedies as their main source of healthcare. Additionally, the high expense of pharmaceuticals and the limited ability of many individuals in developing countries to afford modern medications have driven local populations to turn to medicinal plants, which are recognized for being effective, safe, affordable, and culturally appropriate (Sofowora, 1993).

Nevertheless, challenges such as deforestation, agricultural expansion, excessive harvesting, and rapid population growth resulting in increased demand and consumption pose serious threats to these vital resources. These challenges accelerate the extinction rate of medicinal plants within their natural habitats, resulting in the global loss of important plant species (Tesfaye *et al*., 2009). Recording traditional medicinal plants and their associated knowledge is crucial for facilitating the discovery of novel drug sources and encouraging the sustainable management of natural resources (Abebe, 1986). Researchers and pharmaceutical firms increasingly rely on traditional knowledge (TK) to uncover new drug candidates through bioprospecting and reverse pharmacology approaches. In this context, ethnobotany is recognized as having a significant role (Bengtsson *et al.,* 2000). Cunningham (1996) emphasized that both conserving plant species and safeguarding indigenous knowledge are urgent and essential priorities. Present trends in plant use indicate that environmental issues such as resource depletion and the erosion of indigenous knowledge are affecting this region, representing concerns seen elsewhere in the country. These challenges accelerate the extinction of medicinal plants in their natural habitats, resulting in the loss of species with global importance (Tesfaye *et al.,* 2009). Documenting traditional medicinal plants and the knowledge associated with them is essential for discovering new drug sources and promoting the sustainable management of natural resources (Abebe, 1986). Increasingly, scientists and pharmaceutical companies rely on traditional knowledge (TK) to identify potential

drug candidates through bioprospecting and reverse pharmacology. In this context, ethnobotany plays a vital role by providing valuable insights (Bengtsson *et al*., 2000). Likewise, Cunningham (1996) highlighted that preserving plant species, along with recording and protecting indigenous knowledge, is an urgent and fundamental priority. Current patterns of plant use reveal pressing environmental issues such as resource depletion and the erosion of indigenous knowledge. Concentrated ethnobotanical research is essential for gathering valuable information on plants and indigenous knowledge, which supports conservation and sustainable use. Although an ethnoveterinary study by Yirga *et al*. (2012) was conducted in the study woredas and documented only 24 species of ethnoveterinary medicine, no research has yet integrated medicinal plants used for both human and veterinary purposes. The present study aimed to document the indigenous knowledge of local communities in Zana and Laelay Koraro Woredas, with a focus on medicinal plants used for both humans and animals. A total of 117 medicinal plants were recorded which is higher than the previous investigation. The findings are expected to contribute to the national repository of indigenous knowledge and support the sustainable use of medicinal plants.

Description of the study woredas

Zana and Laelay Koraro are woredas located in the northwestern zone of Ethiopia's Tigray region, as detailed in the recent administrative reorganization shown in Figure 1. These Woredas are bordered to the south by the Tekeze River, to the northwest and north by Tahtay Koraro, and to the east by the Central Zone. The administrative center of Zana is Debre Kerbe, while Laelay Koraro's center is Selekleka. Together, they have a population of 125,028, with 61,977 men and 63,051 women (CSA, 2007). The communities here have long practiced mixed farming, combining crop cultivation with animal husbandry. As a result, their livelihoods are deeply

connected to natural resources, especially plant resources, which play a vital role in meeting their basic needs. Additionally, the study of medicinal plants and their diversity in the two previously mentioned woredas was conducted using various ethnobotanical methods, as outlined below, to promote conservation and foster sustainable use.

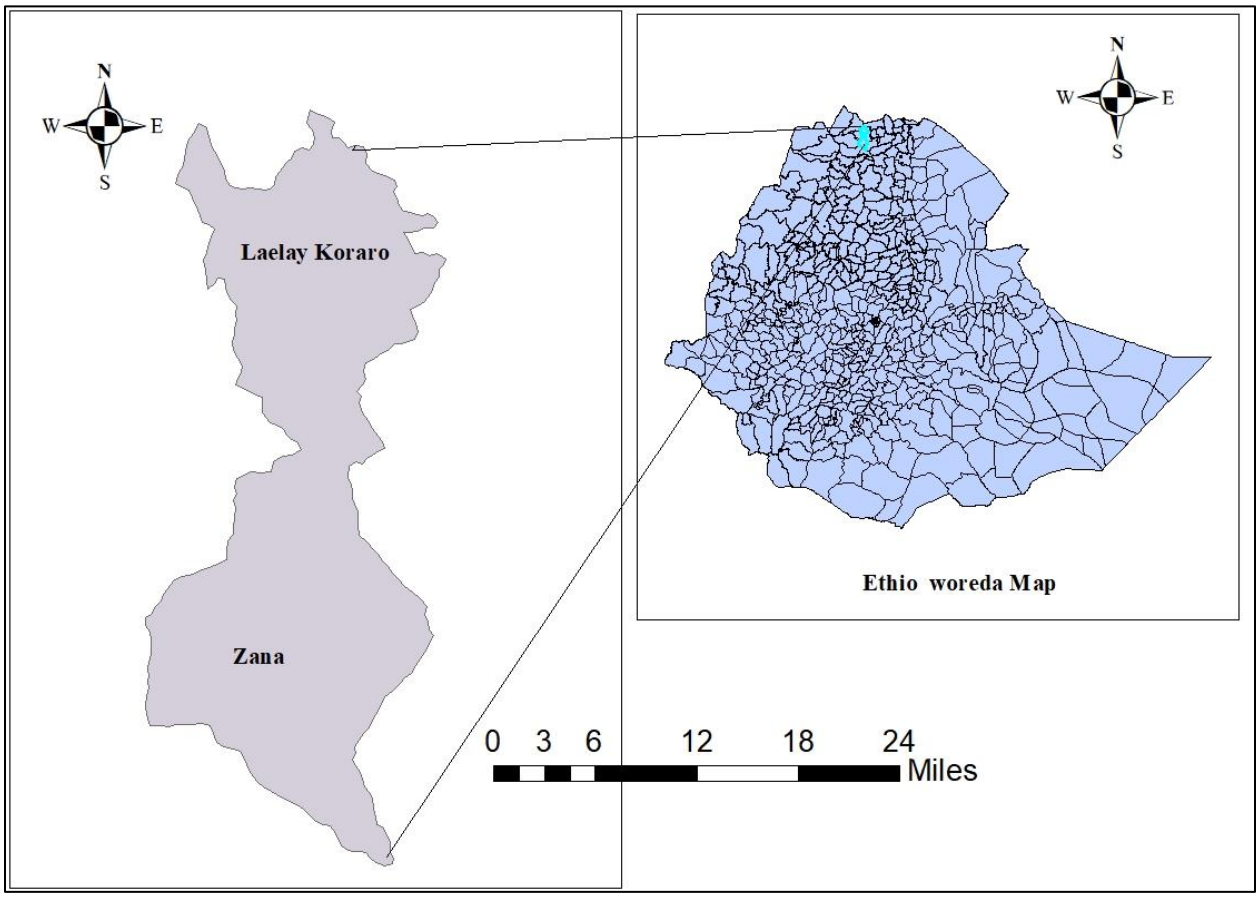

Figure 1: Map illustrating the study woredas

Methods

Site and sample selection

Preliminary surveys on the research site carryout in December 2023. Purposive recruitment of study sites was based on advice from community elders and local government

representatives. The sample size was calculated by the formula of Cochran, $n = \frac{N}{1+N(e)2}$ with a margin of error of 0.05 and a level confidence of 95% Adam (2020). Where, n= sample size, N= number of house hold population s in the study sites. Thus, a sample of 60 (n) respondents, 41 males and 19 females, were selected using purposive and stratified sampling from these two selected areas following that of Martin (1995). Twenty purposively selected key informants were participated by utilizing the referrals of the development agents, local administrators and well respected elders. The selection of key informants was refined by the quality of information that they had provided during the interviews. As traditional experts and custodians of indigenous knowledge about medicinal plants, local healers were inherently qualified to take part as key informant participants.

The morphological features and natural habitats of each medicinal plant species were examined in the field with the help of local guides. Participants engaged in brief group discussions about the therapeutic plants present in the study Woredas. Topics included threats to medicinal plants, their conservation, and the transmission of traditional knowledge within the community. All data collection was conducted with the informed consent of the local informants. Voucher specimens were collected during the guided field walk, then numbered, pressed, dried, and deep frozen for identification purposes. Initial processing occurred on-site before the specimens were transferred to the Mekelle Biodiversity Center for further analysis. Additionally, identification was supported by referencing the Flora of Ethiopia, comparing the collected specimens with those previously documented.

Interview

A semi-structured questionnaire was developed and presented to the informants following a specific sequence. All responses were documented in English, while the interviews themselves were conducted in Tigrigna, the informants' primary language. Each participant was interviewed individually. The respondents consisted of individuals who either resided permanently in the Woredas or had lived there for most of their lives. During the interviews, details were gathered about the local names of medicinal plants, the ailments they address, the parts used, methods of preparation and application, combinations of ingredients, associated risks and their management, as well as other relevant information.

Informant consensus

The relative popularity of each medicinal plant species was determined by the percentage of informants in the area who independently reported using that species for medical purposes (informant consensus). To ensure the reliability and thoroughness of the ethnobotanical data, each informant was interviewed twice throughout the data collection times. Any response that deviated from the consensus was excluded, and a substitute informant was consulted in its place. This approach was adopted because such divergent responses were deemed unreliable. Only the consistent and relevant responses were considered and subjected to statistical analysis (Martin, 1995**).**

Preference ranking

A preference ranking was conducted for five medicinal plants commonly used to treat the most prevalent disease in the Woredas, each with several alternative species, following Martin's (1995) method. Ten key informants participated in this exercise, ranking the plants based on their perceived effectiveness. The plant deemed most effective received the highest score of 5, while

the least effective was assigned a score of 1. These rankings, derived from the cumulative scores of each species, offer valuable insight into the community's preferences for the most effective medicinal plants in managing common ailments in the region.

Direct matrix ranking

A direct matrix ranking was carried out for seven multipurpose medicinal plants frequently mentioned by informants. Ten informants were selectively chosen based on the relative benefits derived from each plant and asked to assign values to various attributes. These attributes included medicinal use, firewood, construction, charcoal, furniture, edible fruits, and fencing. The scores were then totaled to compare the use values of the medicinal plants and to identify the primary causes of their overharvesting.

Threats to medicinal plants

A ranking of threats to medicinal plants was carried out based on reports from the majority of informants in the Woredas, using 10 selected key informants following Martin's method (1995). Seven major threats were identified by most informants, who were then asked to assign a score of seven to the most significant threat and one to the least significant. This information was used to determine the most critical threats to traditional medicinal plants in the region and to guide recommendations for appropriate conservation measures.

Ranking of threatened medicinal plants

Using the method defined by Martin (1995), a ranking of five medicinal plants reported as threatened in the Woredas was conducted with ten key informants, all knowledgeable traditional healers. These informants were given the names of the five plant species reckoned

threatened by the community and asked to rank them based on their perceived level of threat or scarcity, assigning a score of 5 to the most threatened and 1 to the least threatened species. The scores for each species were then summed and ranked accordingly. This process helps identify the most at-risk species, providing a basis for recommending suitable conservation measures.

Data analysis

Ethnobotanical data collected in 2010 and entered into an Excel spreadsheet were summarized using descriptive statistical methods such as frequencies, percentages, tables, and graphs. Various ranking techniques including threat ranking, direct matrix ranking, and preference ranking were applied subsequently. Preference ranking was specifically conducted to identify the most important medicinal plants used for patient treatment, with ranks assigned based on total scores for each attribute. Additionally, Pearson's correlation test was performed using SPSS 16.0 software (SPSS, 2008) to examine the relationships between respondents' knowledge distribution and factors such as age, education, and sex at 95% of confidence interval.

Result and Discussion

The habits of medicinal plants

In the study conducted within the selected woredas, a total of 117 medicinal plant species were identified and documented. These species exhibited a remarkable diversity in their growth habits, reflecting the varied ecological conditions of the area. Among the different forms of plant growth observed, shrubs were found to be the most prevalent category of medicinal plants, followed by trees. Herbs ranked next in abundance, showcasing their significant role in traditional medicine within the community. Climbers, while present in lesser numbers compared to the other groups, still contributed notably to the medicinal flora of the region as shown in the

following figure 2 below. This diversity highlights the rich botanical resources available for healthcare practices and suggests potential areas for further research and conservation efforts.

Hailemariam *et al*. (2009) in the lowlands of southwestern Ethiopia and Amenu (2007) in western Ethiopia both reported a greater abundance of shrubs, consistent with the current findings. Similarly, shrubs emerged as the dominant growth form in studies conducted in the Boosat sub Woredas of central eastern Ethiopia (Hunde *et al*., 2004), the Gimbi Woredas in western Ethiopia (Tolasa, 2007), the Wonago Woredas in southern Ethiopia (Mesfin *et al*., 2009), and the Mana Angetu Woredas in southeast Ethiopia (Lulekal *et al*., 2008). These variations likely arise from agro-ecological differences that support diverse plant species, alongside sociocultural factors that influence the unique traditional knowledge within each community (Bekele, 2007). Herbs are used more often because they are known to be very effective in traditional medicine, as shown by studies in Ethiopia (Baydoun *et al*., 2015). In another area of Ethiopia, people used more shrubs to treat illnesses than other plant parts (Luizza *et al*., 2013; Tewelde, 2020).

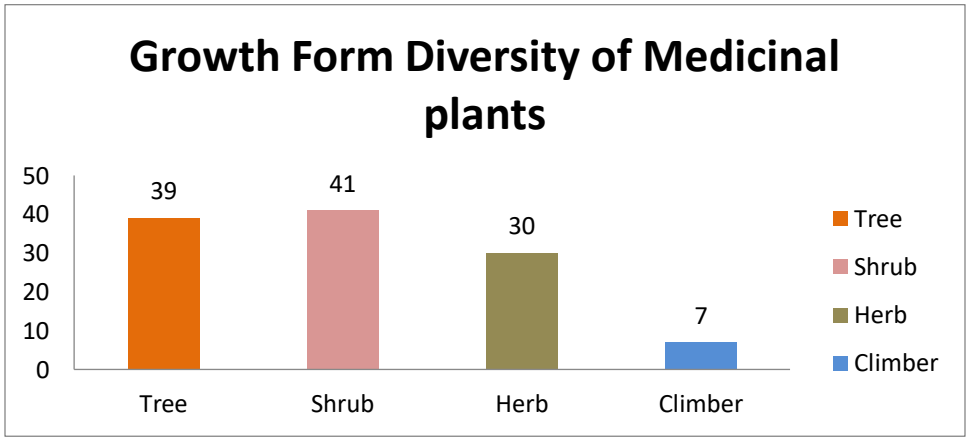

Figure 2: Variation in Growth Forms of Medicinal Plants

Plant parts utilized in traditional medicine

Based on the results gathered from various interviews, it was observed that the leaves are the most frequently utilized part of plants for medicinal purposes. They are favored due to their accessibility and the concentration of active compounds found within them. Following the leaves in common usage are the roots, which are often prized for their potent therapeutic properties, and then the seeds, which are also valued for their medicinal benefits. To provide a clearer overview, Table 1 presents a detailed breakdown of the different plant parts employed in traditional healing practices, highlighting their specific uses and relative frequencies. This information underscores the importance of various plant components in natural medicine and illustrates the diversity of botanical resources harnessed to promote health and treat ailments. Research conducted across various regions of Ethiopia indicates that leaves are more commonly used than other plant parts (Yinger and Yewhalaw, 2007). This practice promotes sustainable harvesting and reduces the risk of overexposing plant species. As a result, the survival of these plants is better ensured (Giday and Ameni, 2003). Abera (2014) corroborated these findings, noting that indigenous healers predominantly employ leaves in their remedies. Because leaves are the primary parts utilized for medicinal purposes in the Woredas, the likelihood of damaging medicinal plants particularly shrubs and trees is minimal. This is because the plant itself is less harmed when leaves are harvested compared to roots, bark, or stems. Similarly, Belayneh and Bussa (2014) observed that leaf components are used more frequently than other plant parts in medicinal applications. Moreover, studies have shown that the leaves contain a wealth of bioactive secondary metabolites, primarily produced to safeguard the plants against harmful agents, which also offer therapeutic advantages for human health issues (Umair *et al*., 2019; Teka *et al*., 2020).

Table 1: Plant parts used for local medicine preparations

Plant parts	Frequency	%
Leaf	56	37.6
Root	34	22.8
Seed	13	8.7
Fruit	9	6
Latex	9	6
Stem	6	4.2
Flower	1	0.6
other parts	21	14.1
Total	149	100

Conditions for herbal remedies' preparation

The highest quality herbal treatments were predominantly made using fresh plant materials, which accounted for a significant 65.4% of the total raw ingredients. Following this, dried plant materials were utilized in 25.2% of the preparations, serving as the second most common form of plant material. Additionally, a smaller proportion, representing 9.4%, comprised treatments made from either fresh or dried materials combined, indicating some flexibility in the choice of raw ingredients depending on the specific formulation or desired therapeutic effect. This distribution clearly highlights the preference for fresh plant material in crafting top-tier herbal remedies, as illustrated in Figure 3.

Likewise, Sori *et al.* (2004) observed that fresh materials proved more effective compared to dry or a combination of dry and fresh materials for treating various health conditions in Borena, southwestern Ethiopia. Correspondingly, most plant parts (69.9%) used in

crafting remedies from medicinal plant species were collected fresh (Abera, 2014; Lulekal *et al*., 2013).

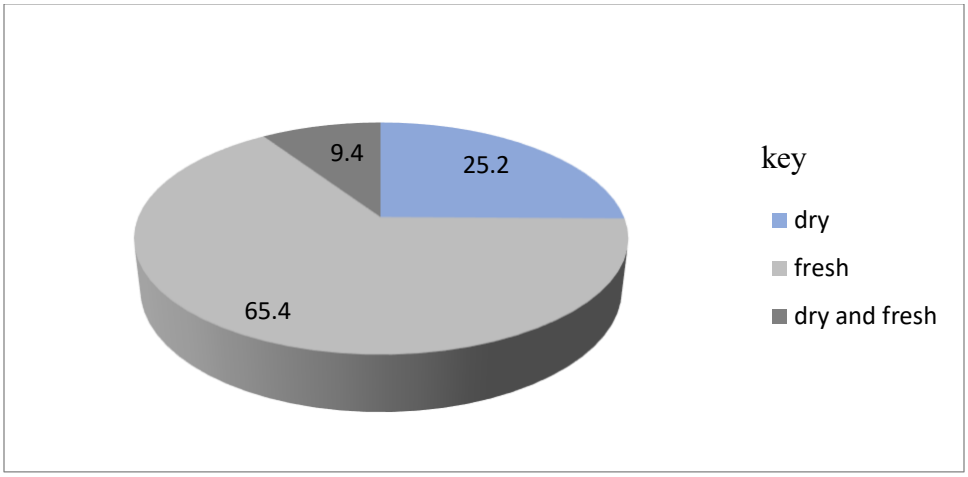

Figure 3: Conditions of Preparation of Herbal Remedies

Preparation, administration, and usage of medicinal plants

According to traditional healers in the Woredas, remedy preparation varies based on the illness being treated. The three most common preparation methods, ranked from most to least frequent, were crushing, pounding, and extracting juice. Additional preparation techniques utilized are detailed in Figure 4.

A related study by Yinger and Yewhalaw (2007) found that crushing (juice) was the predominant preparation method in Oromia Regional State, Southwestern Ethiopia. Similarly, in the Tigray Regional State of northern Ethiopia, Yirga *et al*. (2012) documented comparable techniques, including crushing (30.8%), a combination of crushing and squeezing (19.2%), tying (19.2%), and grinding (11.5%).

Most recipes involved blending multiple plant species with water and various additives such as honey, sugar, butter, salt, and milk. These additives serve multiple roles, including toxin reduction, flavor enhancement, and mitigation of adverse effects like diarrhea and vomiting. Abebe (1986) also noted the presence of such supplementary ingredients in herbal remedies and their possible benefits. Furthermore, it was noted that certain medicinal herbs were incorporated into foods and drinks in ways that modified their taste, making them more palatable. For instance, *Trigonella foenum- graecum* was added to milk to improve its flavor and help alleviate stomach discomfort.

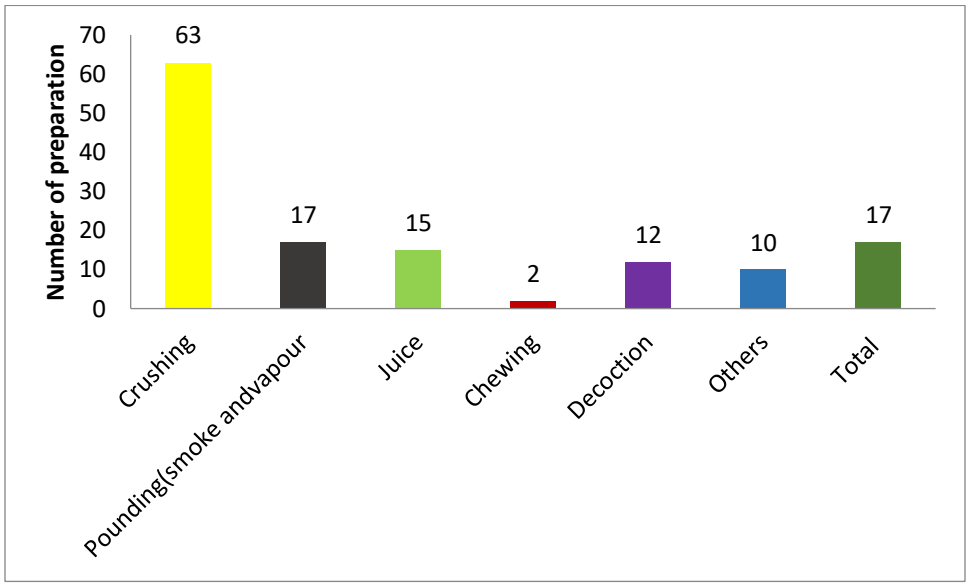

Figure 4: Preparation methods of herbal medicine

Traditional medicine prescription and application methods

Internal use represented a greater proportion of medicinal plant preparation applications, with a relative citation (RC) of 0.61, while external use was slightly less at 0.39 (see Table 2). The local community in the study region employed a range of techniques to apply traditional medicinal plants. The primary routes of administration included oral, nasal, and oracular methods. Furthermore, it was noted that certain medicinal herbs were blended with foods and

drinks in ways that modified their taste, making them more palatable. For instance, *Trigonella foenum-graecum* was added to milk to improve its flavor and help alleviate stomach discomfort. The local community within the study region employed a range of methods to administer traditional medicinal plants, predominantly utilizing oral, nasal, and oracular routes for treatment.

Table 2: Mode of application of traditional medicines

Mode	Route of application	Total citation	Relative citation (RC)
Internal	Oral	63	0.48
	Nasal	11	0.08
	Oracular	7	0.05
External	Fumigant	13	0.10
	Tie on	9	0.07
	Other	29	0.22
	Total	132	

Consensus of informants

The study's results indicate that certain medicinal plants are preferred more than others consequently; *Lepidium sativum* emerged as the primary remedy for fibril illness. *Melia azedarachta*, *Rumex nervosus*, and *Cordia africana* ranked as the second and third most favored, respectively (Table 3). These three species were utilized to address a range of health conditions. The broad therapeutic effects of some plants can be attributed to their ability to target multiple ailments, whereas others exhibit a more focused efficacy against specific problems. According to key informants, the popularity of these plants stems either from their local abundance, which

facilitates easy access, or from their capacity to treat diverse disorders. For instance, *Melia azedaracha* and *Cordia africana* are notably prevalent throughout the region.

Table 3: Consensus of Medicinal Plants cited by Informant

No	Medicinal plant	No of informant cited	%
1	*Lepidium sativum*	56	87.5
2	*Azadrachta indica*	48	75
3	*Cordia africana*	47	73.43
4	*Rumex nervosus*	47	73.44

Ranking the preferred medicinal plants

After carefully selecting ten key informants who possess specialized knowledge about local medicinal practices, a detailed preference ranking was carried out to evaluate five medicinal plants that are traditionally believed to have beneficial effects in treating fibril illness. Fibril illness is identified as the most prevalent disease affecting the population in the study region, making this investigation particularly significant for understanding local health remedies. The preference ranking aimed to discern which plants are most trusted and regarded as effective by community experts.

As presented in Table 4, the results revealed that *Eucalyptus globulus* was rated as the least effective remedy among the five selected plants for treating fibril illness, indicating a lower community confidence or perceived efficacy in its use for this particular ailment. Conversely, *Lepidium sativum* received the highest rating, being deemed the most effective by the informants based on their experiences and traditional knowledge. This suggests that *Lepidium sativum* holds a prominent place within the local medicinal practices for managing fibril illness. Additionally,

Melia Azadrachta was ranked as the second most effective remedy, underscoring its significant role in the traditional treatment options available to the community. These findings highlight the community's preferences and beliefs regarding the comparative effectiveness of these medicinal plants, reflecting their importance in local healthcare strategies and cultural practices.

Table 4: Ranking of preferred Medicinal plants for fibril disease

Medicinal plants	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	Total	Rank
Lepidium sativum	5	5	4	3	5	5	4	5	5	4	45	1st
Eucalyptus globules	1	1	1	1	1	2	3	1	3	2	16	5th
Melia Azadrachta	4	4	5	5	3	4	5	4	4	5	43	2nd
Cordia africana	3	3	2	2	4	3	1	2	1	1	22	4th
Trigonella foenum-graecum	2	2	3	3	2	1	2	3	2	3	23	3rd

Ranking through direct matrix analysis

To evaluate the relative significance and validate the primary effects of each medicinal plant species, a direct matrix ranking method was employed. This approach involved systematically comparing and scoring the plants based on their multifunctionality and the range of their applications within the community. The results of this comprehensive analysis highlighted *Cordia africana* as the most multifunctional medicinal plant, demonstrating its wide array of uses and vital role in local healthcare and daily life. Following closely was *Acacia lehai*, which was ranked second due to its significant versatility and utility in various community activities. Conversely, *Croton macrostachyus* was identified as the least versatile among the studied plants, indicating more limited functional roles within the local context.

Furthermore, an extensive survey of the different Woredas revealed that community members actively collect medicinal plants for a diverse array of uses. These uses extend beyond medicinal purposes to include essential functions such as fencing to protect fields and households, providing fodder for livestock, construction materials for building and repairs, and as sources of firewood and charcoal for cooking and heating needs. The detailed breakdown of these uses is summarized in Table 5, which provides a comprehensive overview of how medicinal plants contribute to various aspects of daily life and community resilience across the different Woredas. This detailed understanding underscores the importance of conserving these plant species not only for their medicinal value but also for their broader ecological and socio-economic roles.

Consistent with these results (Table 5), Tolassa (2007) reported that 78.82% of medicinal plants utilized by communities in western Ethiopia fulfill multiple purposes. This multifunctional use may heighten the demand and pressure on these plant resources. To reduce strain on medicinal trees, effective strategies such as domestication, in-situ conservation, and the introduction of alternative tree species for non-medicinal uses are necessary. To assess the significance of multipurpose plants to local populations and the degree of threats to their various uses, seven commonly used multipurpose species and seven use categories were selected for a direct matrix ranking analysis (Table 5). These seven species were chosen because they were frequently encountered and similarly represented before the ranking. Results indicated that firewood collection was the primary reason locals harvested these multifunctional species, ranking highest among other uses. Furnishings represented the category with the least presence. These results suggest that the continued existence of the highest-ranked (most preferred) species

is at risk, especially considering the local community's everyday reliance on these resources (Amenu, 2007).

Table 5: Medicinal plants ranked by direct matrix

Use classification	*Acacia*	*lehai*	*Cordia*	*africana*	*Dodonaea*	*angustifolia*	*Croton*	*macrostachyus*	*Olea europaea*	*subsp.*	*Cuspidate*	*Ziziphus spina*	*christi*	*Carissa*	*espinarium*
Medicine	6		7		2		1		5			4		3	
Charcoal	6		2		1		3		5			4		7	
Firewood	6		4		7		4		3			3		5	
Construction	5		6		7		1		1			1		2	
Furniture	0		7		0		0		1			0		0	
Edible fruit	0		7		0		0		0			6		4	
Fence	6		3		4		1		2			7		5	
Total	29		36		21		10		17			25		26	
Rank	2nd		1st		5th		7th		6th			4th		3rd	

Factors threating medicinal plants

Informants highlighted agricultural expansion as the primary threat to medicinal plants, with firewood collection and drought ranking next (Table 6). The outbreak of war in northern Ethiopia, especially in the Tigray region, coupled with the federal government's complete blockade of services, has driven community members to deforest plants for cooking fuel, income generation, and cropland expansion. The scale and intensity of deforestation differ across

regions, with particularly severe rates noted in areas hosting large populations of internally displaced persons.

Table 6: Ranking of threats to medicinal plant

Threats	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	Total	Rank
Drought	5	4	7	5	6	5	5	7	4	6	54	3rd
Agricultural Expansion	6	7	5	6	6	6	7	5	7	7	62	1st
Fire wood	7	6	6	6	7	7	6	6	5	5	61	2nd
Charcoal	2	2	1	1	3	2	2	2	1	2	18	6th
Construction	3	5	3	3	2	3	3	3	3	4	32	5th
Fodder	1	1	2	2	1	1	1	1	2	1	13	7th
Urbanization	6	5	7	7	4	5	4	6	6	3	53	4th

Key: R= represented respondents

The wild nature of the referenced medicinal plants leaves them vulnerable to numerous human-induced threats. Among these, selected key informants ranked agricultural expansion as the primary factor, followed by firewood collection and drought, with fodder demand considered the least impactful. Research by Mesfin *et al*. (2009) identified agricultural expansion, extensive fuelwood harvesting, and seasonal drought as leading causes of environmental degradation and medicinal plant decline. Similarly, Zenebe *et al*. (2012) reported that agricultural expansion posed the most significant risk to medicinal plants in Asgede Tsimbla, Tigray regional state, northern Ethiopia. Overall, various studies across Ethiopia highlight that wild plant resources, particularly medicinal species, face threats from a combination of anthropogenic and natural factors, including agricultural growth, fuel and construction material collection, overgrazing, and recurrent drought. Using insights gathered from ten experienced key informants, a

comprehensive assessment was conducted to evaluate the threat levels faced by various medicinal plants. Based on this evaluation, five medicinal plant species were identified and subsequently ranked according to the severity of the threats impacting their survival and availability. This ranking provides valuable information for conservation priorities and highlights the urgent need for protective measures. The detailed results of this assessment are presented in Table 6, which outlines the specific ranking of these threatened medicinal plants.

Table 7: Ranking of threatened medicinal plants

Scientific name	Informant											
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Total	Rank
Acacia lehai	4	5	5	4	5	4	3	5	4	5	44	1ST
Acokanthera schimperi	5	4	3	3	4	3	5	3	3	3	36	3rd
Anogeissus leiocarpa	1	1	2	1	1	2	1	2	2	1	14	3rd
Gardenia ternifolia	3	3	1	2	2	1	2	1	1	2	17	4th
Phoenix reclinata	2	2	4	5	3	5	4	4	5	4	38	2nd

The findings (Table 7) revealed that *Acacia lehai* was the most endangered species, with *Phoenix reclinata* and *Acokanthera schimperi* following closely, while *Anogeissus leiocarpa* was identified as the fifth at risk plant species.

Source and transmission of indigenous medicinal plant knowledge

Table 8 presents a comparison of medicinal plant knowledge distribution among informants according to age, kebele, gender, and educational background. The data gathered from the Woredas indicates that older informants cited a greater number of medicinal plants, showing a strong positive correlation between age and knowledge at 95% of confidence interval. Additionally, there is a significant relationship between age differences and the extent of medicinal plant knowledge. Moreover, males were found to be more actively involved than females in traditional healing practices within the study woreda. The findings align with those of Giday (1999), who reported that individuals over 40 years old identified a greater number of medicinal plants among the Zay people of Ethiopia. Additionally, males consistently cited more species across different localities. Giday and Ameni (2009) also observed that participants above 40 years of age mentioned significantly more therapeutic plants within the community. Conversely, Yinger and Yewhalaw (2007) did not find a statistically significant correlation between age and the utilization of medicinal plants by inhabitants of the Jimma zone in southwestern Ethiopia, possibly due to the younger generation acquiring knowledge in that region. In the present study, elders demonstrated greater expertise, likely owing to their direct experiences with these herbs. The difference in traditional medicinal plant knowledge between age groups may ultimately result in the gradual erosion of ethnobotanical wisdom over time (Abebe and Ayehu, 1993).

Table 8: Correlations of Age, sex and educational level of informant

Demographic variable		Age	Sex	Education
Age	Pearson Correlation			

	Sig. (2-tailed)			
	N			
Sex	Pearson Correlation	.196		
	Sig. (2-tailed)	.121		
	N	64		
Education	Pearson Correlation	-.264*	.191	
	Sig. (2-tailed)	.035	.131	
	N	64	64	
Knowledge	Pearson Correlation	.717**	.173	-.255*
	Sig. (2-tailed)	.000	.172	.042
	N	64	64	64
Correlation is significant at the * 0.05 level and** 0.01 level (2 tailed).				

Educational background of respondents

The data gathered from the Woredas indicates that most interviewees were either illiterate or had only received sporadic education, possessing basic reading and writing skills. The results demonstrate a significant negative relationship between formal education and knowledge of medicinal plants. This suggests that higher levels of modern education tend to inhibit the acquisition of traditional medicinal plant knowledge.

In the Woredas, informants primarily acquired their knowledge of traditional medicinal plants from family members, with religious sources such as books serving as the next most common source, as illustrated in Figure 5 below.

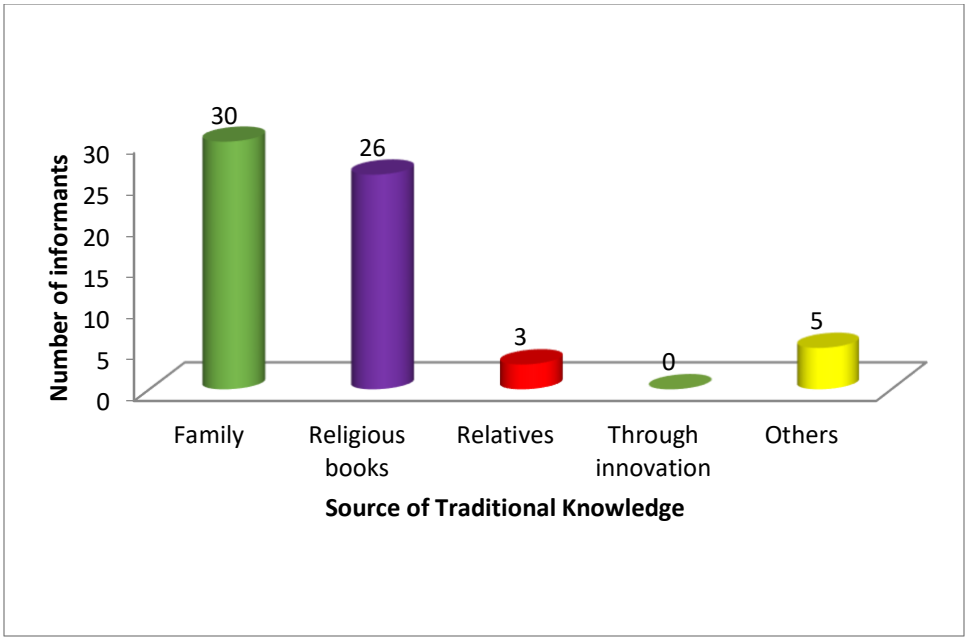

Figure 5: Source of traditional knowledge for traditional healers

Informants acquired their knowledge about traditional medicinal plants primarily through oral communication from their parents or grandparents. This means that the wisdom and understanding of these plants have been passed down verbally across generations, emphasizing the importance of family lineage in preserving this valuable cultural heritage. Supporting this observation, Tolassa (2007) found that a significant majority (91%) of traditional medicinal plant knowledge is transmitted directly from parents to their children, highlighting the dominant role of parental guidance in maintaining and sharing this information.

Exploring the transfer of indigenous knowledge more deeply, data collected from the Woredas reveal that traditional healers predominantly rely on oral transmission as the main method to pass down their expertise. This process typically involves sharing knowledge through spoken communication within the family, where an experienced healer teaches a close relative, most often the eldest son. Figure 6 illustrates this pattern, showing the strong preference for

familial and generational learning as a means of safeguarding traditional healing practices. Such oral transmission ensures that the knowledge remains within the family, preserving the cultural identity and continuity of traditional medicinal practices over time.

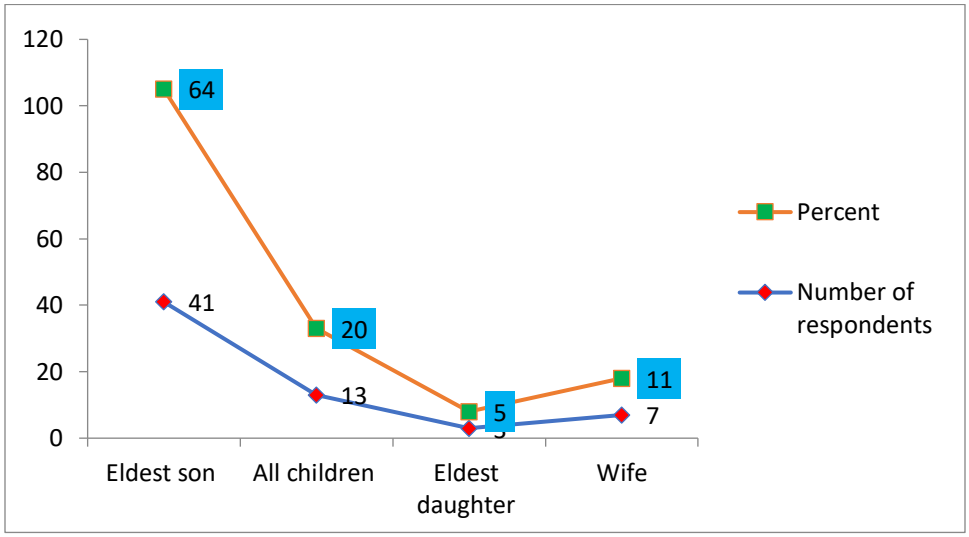

Figure 6: Transfer of traditional medicinal plant knowledge

The informants also disclosed a significant degree of secrecy surrounding the transmission of knowledge within the family circle. The preference for passing medicinal plant knowledge primarily to the eldest son restricts the involvement of women in the Woredas. It was also found that the way indigenous knowledge is conveyed to offspring follows a similar pattern.

Plant Conservation in the Woredas

The efforts to conserve and sustainably manage forests, natural resources, and forest species within the study Woredas are notably commendable. Annually, seedlings are produced as shown in figure 7. These seedlings are nurtured in nurseries before being transplanted into degraded areas to restore vegetation and ensure the availability of trees for various purposes, which greatly supports the survival of medicinal plants. However, there remains a lack of

designated sites for cultivating medicinal plants, particularly within the Woredas. Studies in Ethiopia's Metekel zone and Asagirt district highlight ongoing efforts to preserve native medicinal plants (Awoke *et al*., 2024; Anbessa *et al*., 2024). Despite this, community participation remains insufficient (Tahir *et al*., 2023; Dessie and Amsalu, 2024). Prior to the onset of the war in the Tigray region, three permanent seedling-producing forest nursery sites operated near the study areas. Currently, many nurseries have been deforested, and their stored materials have been stolen, making it difficult to carry out seedling production in the same way as before. Despite these destructive events, the relevant sector in the study has attempted to compensate by producing various species of forest and rangeland plants for different uses, as illustrated in Figure 7 below. To ensure sustainable utilization and protect the traditional knowledge, it is crucial to raise awareness and implement both in situ and ex situ conservation strategies throughout the country.

Figure: 7: Durshem Nursery Site of Laelay Koraro Woreda

Diversity of reported medicinal plants

In the study conducted across both woredas, a total of 117 different medicinal plant species were identified. These plants belong to a diverse range of families and genera, representing 53 distinct plant families and organized into 93 genera. Among the 117 plant species used for medicinal purposes, 63% are sourced from wild habitats, 19% come from home gardens, and 13% are harvested from farmlands, according to the study's findings presented in Table 9. An additional 2% originate from farmlands, and a small proportion of 3% is obtained from a combination of home gardens and wild areas. Notably, some plant families are more prominent in traditional medicinal practices. The Fabaceae family was the most frequently used, accounting for approximately 11.11% of all identified medicinal plants. Following closely was the Solanaceae family, representing about 6.8%. Although less common, the Euphorbiaceae family still contributed significantly, making up roughly 4.3% of the medicinal species utilized by the local communities. This distribution highlights the region’s rich botanical diversity and

emphasizes preferred plant families in traditional medicine across the two woredas study sites. This indicates that the majority of medicinal plants utilized by local communities are directly gathered from wild environments. In Ghimbi Woreda, Oromia Regional State, Southwestern Ethiopia, Balcha Abera (2007) observed that a significant 81.6% of the medicinal plants recorded in his study were collected from the wild, with the remaining plants cultivated in community home gardens. This result also aligns with the broader findings, highlighting the reliance on wild-harvested plants. For example, *Lepidium sativum* is a widely recognized medicinal plant commonly cultivated by locals in their home gardens, as well as intercropped with various crops in farmland for both medicinal and other uses. In the kebeles of Both Woredas, some traditional healers choose not to grow certain plants used for specific ailments in their own gardens to maintain the secrecy of their medical knowledge. This suggests that most therapeutic plants found in household gardens also serve additional roles, often used as food, spices, or ornamental plants. Since many medicinal plants are sourced from the wild, their existence is threatened by habitat destruction. Similar concerns have been highlighted by other researchers (Hailemariam *et al.,* 2009), who call for urgent measures to ensure their conservation.

In the Woredas, the Fabaceae family was the most frequently used medicinal plant group, comprising 13 species (11.11%), followed by Solanaceae and Euphorbiaceae with 8 species (6.8%) and 5 species (4.3%), respectively. Similar research conducted elsewhere in the country (Flatie *et al*., 2009) also identified Fabaceae as the predominant medicinal plant family. Additionally, other Ethiopian studies highlighted the prominence of Asteraceae (Getaneh and Girma, 2014; Shuaib, 2018) and Lamiaceae (Hailemariam *et al*., 2009) as a dominant family. The findings from Laelay Koraro and Zana Woredas align well with earlier research results by

Teklehaymanot *et al*. (2007), Checol (2017), Tewelde and Mesfin (2020), Lulekal (2014), Teklehaymanot and Giday (2007), and Tewelde (2023).

Table 9: Scientific and Family names, Local name (Tigrigna), Growth habit, Plant parts utilized, Number of informants referencing as medicinal plants (MPs), Ailments treated, and Methods of preparation and application

Scientific and Family name	Local name	Habit	Parts used	Disease treated (used for)	Preparation and application
Lagenaria ziceraria L. (cucurbitaceae)	Hamham	H	Seed	Evil eye	Combine the seed with fire and cleanse it using the smoke.
Allium sativum L. (Alliaceae)	Tsaeda shingurti	H	Bulb	Cough	Nourishing the raw bulb with *injera*
				febrile illness	Crush and cream the whole body
				Ringworm	Cut the bulb into two parts and gently rub the affected area by it.
Melia azadrachta L. (Meliaceae)	Nim	T	Leaf	External wound	Grind it down and smooth it onto the troubled area.
				Febrile illness	Let it boil in water and use the smoke to fumigate.
Cordia africana Lam. (Boraginaceae)	Awhi	T	Leaves	Tonsillitis	Mash, blend through a water filter, and drink the extracted liquid.
				Tiniascaplis	Grind the leaf and then apply the paste to the affected area contaminated with fungus.
Rumex nervosus Vahl. (Euphorbiaceae)	Machicheo	S	Leaf/Stem	Ascariasis	Consume or masticate the succulent leaf or stem and swallow the liquid.
			Leaf	Itching /skin rash	Mix with *Allium sativum* leaves, soak in water, and use to bathe the body.
Clematis hirsuta Fresen. (Ranunculaceae)	Hareg	C	Root	Anthrax **	Mash the roots with butter to create a paste, then apply it.
			leaf	Herpes zoster	Burn leaves of *Dodonaea angustifolia*, then grind the mixture into powder. Combine it with butter and apply the paste to the affected area.
Datura stramonium L. (Solanaceae)	Mezerbae	H	Leaf	Dandruff	Crush and cream on the shaved head.
				Abortion	Grind it down, strain it out, and sip half a cup of tea.
Aloe megalacantha Baker (Aloaceae)	Ere	S	Latex	Scabies*	Crush, squeeze and cream the infected skin with it.
				Fascioloiasis*	Crush; add 1-liter water and drink.

Datura innoxia L. (Solanaceae)	Absho	H	Leaf	Evil eye	Crush and add to fire and fumigate
			Seed	Toothache	Grinding and mix with water and drink
Kniphofia pumila (Ait.) Kunth. (Asphodelaceae)	Shingurti zibie	H	Bulb	Evil eye	Immerse it in water infused with *Rumex nervosus* leaves, and then cleanse the body using the mixture.
Vicia faba L. (Fabaceae).	Balengua	H	Seed	Anthrax	Crush and spread the paste over the affected area.
Lepidium sativum L. (Brassicaceae)	Shimfae	H	Seed	Wound/sore	Grind the seed and bulb of *Allium sativum* and bind it to the irritated area.
				Abdominal pain	Grind the seed, add water and drink the mixture.
				Swelling	Pound the seed and apply it on affected part.
			Stem	Hemorrhoids	Burn it on fire, then immediately place and press it onto the affected area while still warm.
Boscia salicifilia Oliv. (Capparaceae)	Awo	T	Leaf	Toothache	Chew and keep the paste on the infected tooth.
Ruta chalepensis L. (Rutaceae)	Chena adam	H	Leaf & fruit	Abdominal pain	Crush and filter ingredients, add to coffee, stir, and drink.
				Cough	Crush and mix with Allium sativum, wrap in cloth, and insert into the nostril.
Citrus aurantifolia (Christm.) Swingle (Rutaceae)	Lemin	T	Fruit	Paralyses	Mix *Calpurina aurea*, *Lepidium sativum*, and *Plumbago zeylarica*, then soak in *Lagenaria siceraria* for 7 days. Wash each morning for 7 days with *Rumx nervosus.*
Zehneria scabra (Linn.f.) Sond *(*Cucurbitaceae)	Hareg ressa	H	Leaf	febrile illness	Boil with *Eucalyptus globules*, *Justicia schimperina* and water and fumigate by its smoke.
Grewia ferruginea Hochst (Malvaceae)	Tsinquayt	S	Bark/Leaf	Leech, fire burn **	Extract the liquid, strain it, and then drink, or apply it directly to the affected area.
Nicotiana glauca R.Grah (Solanaceae)	Chenawe	S	Leaf	Leeches' infestation*	Crush, filter and add fluid through the nose.
Calotropis procera (Aiton)W.T. Aiton (Asclepiadaceae)	Gindae	S	Leaf / latex	External wound	Use leaves of *Ficus palmata* to crush into a poultice, then apply the paste to the affected area and continue until healing occurs.
Ocimum lamiifolium Hochst. ex Benth. (Lamiaceae)	Demak asie	H	Leaf	Headache, Febrile illness	Crush, squeeze, adds to coffee and drink.
Anethum graveolens L. (Apiaceae)	Shilan(slien)	H	Whole	Urine retention **	Crush the plant, filter the liquid, and then drink.
Eucalyptus globules Labill. (Myrtaceae)	Tsada kalamitos	T	Leaf	cough	Simmer it together with Carica papaya leaves in water and breathe in the steam.

Zingiber officinale Roscoe. (Zingiberaceae)	Zingible	H	Root	Abdominal pain	Masticate and ingest the liquid.
Croton macrostachyus Del. (Euphorbiaceae)	Tambok	T	Leaf	Ring worm	Crush the leaf and rub the infected part by the paste.
Ficus palmata Forssk. (Moraceae)	Beles adgi	S	Latex	Hemorrhoids	Cover the infected area thoroughly with the milky latex until the condition is remedied.
Olea europaea subsp.*cuspidata* (Wall. ex (Oleaceae) G.Don) Cif., L'Olivicoltore (Oleaceae)	Awlie	T	Stem	Arthritis	Mix with *Rumex nervosus, Myrica salicifolia* and *Clerodendrum myricoides,*
			Leaf	Womb infection	Mix with *Allium sativum* and honey, eat 3-tea spoon per day for 7 days.
Capparis tomentosa Lam. (Capparaceae)	Andel	S	Root	Evil eye	Put the root on fire and fumigate the smoke.
			Bark	Evil eye	Pound and take through nasal cavity.
Rhamnus prinoides L'Herit.(Rhamnaceae)	Gesho	S	Seed	Tinea capitis	Rub it onto the area that needs care.
Diospyros mespiliformis Hochst. ex A. DC. (Ebenaceae)	Aye	T	Flower	Ring worm	Rush and filter it and drink.
Withania somnifera L. (Solanaceae)	Agol	H	Leaf	Eye infection	Simmer it in water combined with *Eucalyptus globulus* leaves, *Achyranthes aspera* and *Cynoglossum lanceolatum* roots, along with *Zehneria scabra* leaves, and then inhale the vapor.
			Whole	Evil eye	Crush by mixing with roots of *Carissa spinarum* and put it on for fumigation.
				Paralysis	Place it on fire for fumigation.
			Root	Evil sprit	Crush and blend together the roots of *Clerodendrum myricoides*, *Carissa spinarum*, *Jasminum gratissimum*, and *Maytenus senegalensis*, then ignite the mixture for fumigation purposes.
Euclea racemosa Murr. (Ebenaceae)	Kulio	S	Root	Evil eye	Mix with *Carisa spinarum,* pound and take through nose.
			Bark	Urine retention	Chew, swallow the liquid only.
			Leaf	Scabies	Pound mix with butter and creamed the infected site.
Opuntia ficus-indica (L.) Miller (Cactaceae)	Kulqual bahri	S	Leaf	Anthrax	Apply heat, and subsequently placing it on the affected area while it remains warm.
Echinops kebericho Mesfin (Asteraceae)	Dander	H	Root	Febrile illness	Set it on fire and fumigate with its smoke.
				Epidemic	Set a fire, add root and fumigate the house.

				Abdominal pain	Pound, mix the ingredients with coffee and drinking it.
Acacia lehai Benth.(Fabaceae)	Lehay	T	Flower	Bee attraction	Fumigate the hive of the bee with wet condition of the flower together the flower and leave of *Ocimum lamifolium*.
Gomphocarpus purpurascens A.Rich. (Asclepiadaceae)	Tseba dimu	H	Latex	Ring worm	Smear the infected part by latex until treated.
Rhus glutinosa A. Rich. (Anacardiaceae)	Tetaelo	T	Leaf	Despair	Crush with *Justica schimperi* and mix with honey and eat 3-tea spoon early in the morning for 14-consecutive days.
Brassica rapa L.(Brassicaceae)	Hamli-adri	H	Leaf	Wound	Crush & bond on the injured area
Pterolobium stellatum (Forssk.) (Fabaceae)	Qenteftefe	S	Root	Dislocated bone	Handle the broken section and apply a mixture of root remedy and butter to it.
Capsicum annuum L.(Solanaceae)	Gue-berbere	H	fruit	Leeches *	Pound, homogenize in water and drink.
Amorphophallus abyssinicus (Rich.) N.E.Br. (Araceae)	Hamba gitae	H	Leaf	Tinea capitis	Crush the leaf and apply the paste on affected part.
Calpurnia aurea (Ait.) Benth (Fabaceae)	Hitsawtsi	T	Latex fruit	Scabies*	Crush, homogenize in water and wash the body.
Lycopersicum esculantum Mill. (Solanaceae)	Komodere	H	Leaf	Leeches *	Grind the leaf, add the squeezed fluid through their nose.
Heliotropium cinerascens DC & A.DC. (Boraginaceae)	Amam gimel	H	Leaf	Fire burn	Crush and squeeze the liquid directly on to the damaged part.
Clerodendrum myricoides (Hochst.) R. Br. Ex Vatke (Lamiaceae)	Surbetri	S	Leaf stem	Headache and Epilepsy	Crush, squeeze, add to Sugar and drink the fluid.
Cucumis ficifolius A. Rich (Cucurbitaceae)	Rambo ambo	H	Root	Rabbis **	Pound, mix with milk and drink it.
Eucalyptus camaldulensis Dehnh. (Myrtaceae)	Keyh kalamitos	T	Leaf	Eye disease	Heat it in water and breathe in its steam.
Trigonella foenum-graecum L. (Fabaceae)	Aba-ake	H	Seed	Abdominal pain	Grind, add water and drink the liquid.
				Swelling **	Grind together with beans and apply the resulting paste to the affected area.
Ficus vasta Forssk. (Moraceae)	Daero	T	Bark	Ascariasis	Crush, mix with honeybee and then eat the mixture.
Ricinus communis L. (Euphorbiaceae)	Guile	H	Leaf	Hornworm	Ground down, pressed, and applied to the affected part.
Coffee arabica L. (Rubiaceae)	Bunna	T	Fruit	Fire burn	Roast, pound and mix with sugar, placed on the burned part.
Euphorbia tirucali L. (Euphorbiaceae)	Kinchib	S	Latex	Swelling *	Apply a layer of latex to cover the infected area.

Cissus petiolata Hook.f. (Vitaceae)	Alkie	C	Leaf	Snake bite *	Crush the leaf, add water, and then drink the mixture.
Gardenia ternifolia L. (Rubiaceae)	Hatsinay	T	Stem	Sprain	Crush, smear on the affected part.
Euphorbia abyssinica Gmel (Euphorbiaceae)	Kulqual	T	Latex	Haemorrhoids	Apply the latex on affected part
Rumex nepalensis Spreng. (Euphorbiaceae)	Shemb obaeta	H	Root	Abdominal pain	Crush, filter and drink.
				delivery facilitater	Insert the root into the ready womb for making smooth delivery.
Rumex abyssinicus Jacq. (Euphorbiaceae)	Mequmeqo	H	Root /leaf	Headache	Add the part to tea and drunk the mixture.
			Leaf	Ascariasis	Crush the leaf, filter the liquid, and then drink.
				Toothache	Crushing it and then savoring the flavor with a cup of freshly boiled coffee or tea.
Buddleja polystachya Fresen. (Budlejaceae)	Metere	S	Leaf	Leeches *	Crush, add liquid and apply through the nose.
Dodonia angustifolia L.f. (Sapindaceae)	Tahses	T	Leaf	Scabies	Roast, pound, mix with butter and creamed the infected part.
Citrullus colocynthesis (SCHRAD) (Cucurbitaceae)	Engule bayta	C	Root	Abdominal pain	Chew the fluid thoroughly, then swallow carefully.
Carica papaya L. (Caricaceae)	Papaya	T	Leaf	Fibril illness	Simmer it in water combined with Eucalyptus globulus leaves and breathe in the steam.
			Latex	Ringworm	Apply the latex on the itchy rash.
Oxalis corniculata L. (Oxalidaceae)	Chew mirakut	H	Bulb	Tapeworm	Remove the outer part and eat it alone or mixed with enjera (local food).
Terminalia brownie Fresen *(*Combretaceae)	Weyba	T	bark	Abdominal problems/diarrhea,	Crush, filter and drink the filtered every morning after the meal for two weeks.
Anogeissus leiocarpa. (DC.) Guill. & Perr. (Combretaceae)	Hanse	T	Root	Stomach pain	Crush, filters the fluid & drink.
				Diarrhea	Crush and drink the fluid.
			Leaf	Malaria	Crush the leaf and drink it.
				wounds **	Tie on the injured part.
Schinus molle L. (Anacardiaceae)	Tikur berbere	T	Leaf	Itching /skin rash	Combine crushed *Withania somnifera* leaves, *Lepidium sativum* seeds, and *Allium sativum* bulbs, then soak the mixture in water. Use this infusion to wash the body by it.

Sorghum bicolor (L.) Moench. (Poaceae)	Keyh leqa	H	Seed	Herpes zoster	Boil it in water and wash body with it.
Acacia abyssinica Hochst. ex Benth (Fabaceae)	Chiea	T	Stem/ bark	Ring worm	Place it on the fire, cream the infected part by the liquid which creates during burning
			Leaf	External wound infection *	Crush and place on the wound
Carissa spinarum L. (Apocynaceae)	Agam	S	Root	Evil spirit	Place on fire and fumigate the smoke
			Root bark	Evil eye	take through nose
Ziziphus spina (L.) Desf. (Rhamnaceae)	Geba,	T	Leaf	Flaking scalp	Dry, grind it into a powder, mix with butter, and then apply it to the affected area.
				Head wound infection	Crush and scrub it onto the sore area.
Tragia cinerea (Pax)&Radcl-smith *(*Euphorbiaceae)	Amae	Cl	Leaf	Anti-blooding	Rub on the affected part.
Agave sisalana Perrine ex Engelm. (Agavaceae)	Eka	H	Stem	Hearing aliment	Squeeze and add a drop through ear.
Hypericum annulatum Moris. (Hypericaceae)	Aklti	H	Leaf	Eye infection **	Grind, add butter and apply on affected part.
Kalanchoe quartiniana A. Rich. (Crassulaceae)	Adeaka ,	H	Leaf	Paralysis	Crush, pour in water, and rinse the body with the mixture.
Clutia abyssinica Juab. & spach (Fabaceae)	Taetaeta	S	Root bark	Evil eye	Loop it around the neck.
Bridelia micrantha (Hochst.) Baill (Phyllanthaceae)	Abetere	T	Bark	Scorpion bite	Crush, squeeze the fluid and drink the filtered fluid.
Otostegia integrifolia Benth. (Lamiaceae)	Chiendog	S	Leaf	Ascariasis	Mince, sift, and sip the liquid.
				Stomach discomfort	Masticate the liquid and then swallow.
				Fleas /lice infestation	Put on the fire and then fumigate.
Ximenia americana L.*(*Ximeniaceae)	Mileo	T	Root	Anti-vomit	Squeeze, strain, and sip the liquid.
				Evil eye	Place on fire and fumigate by its smoke.
Dyschoriste radicans (Hochst. ex A.rich.) Nees. (Acanthaceae)	Taetaeta bayta	H	Leaf	Anthrax **	Apply the mixture by blending it with *Cucumis ficifolius* leaves, then add honey and spread it over the affected area.
				Wound/sore	Crush it by mixing with saliva, salt and bulbs of *Allium sativum* and use or fasten around the affected area.
Silene macrosolen Steud. Ex A. Rich. (Caryophyllaceae)	Saerosaero	H	Root	Repelling Snakes	Place it on fire for fumigation.
Solanum mariginatum L.f. (Solanaceae)	Abyi ungule	S	Seed	External wound	Grind and apply on affected part.
				infection	Crush and apply through the nose.
			Fruit	Breathing problem *	Crush by mixing with roots of *Zehneria scabra*, and *Verbena officinalis*, filter and drink the fluid.

*Catha edulis (*Vahl) Forssk. ex Endl. (Celastraceae)	Chat	T	Leaf	Evil eye	Chew and brochette on the face and head of patient.
Bidens camporum (Hutch.) Mesfin (Asteraceae)	Tselime teneg	H	Leaf	Eye infection	Gently squeeze the leaf to apply the liquid into the affected eye.
			Whole	Febrile illness	Crush the part, filter the liquid, and then drink it.
Allium cepa L. (Alliaceae)	Qeyih shigurti	H	Bulb	Common cold	Smell the slice of the internal part of the onion during morning time for about 2 weeks
Lantana camara. L.(Verbenaceae)	Shigot adgi	S	Leaf	Wound/sore	Crush the leaf, mix it with saliva, and then apply it directly to the wound.
Striga hermonthica (Del) Benth (Scrophulariaceae)	Metselem	H	Leaf	Lice in livestock*	Squeeze, filter and apply the fluid on the affected part.
Syzgium guineense Cham. *(*Myrtaceae)	Liham	T	Leaf	Evil eye	Crush the dried leaf and tie it around the neck.
			Root	Wound sore	Mix the powder with water and pour it onto the sore.
Phoenix reclinata Jacq. (Arecaceae)	Siye	T	Root	Evil eye	Chew and swallow the fluid.
Plumbago zeylanica L. (Phytolaccaceae)	Aftuh	H	Root	Wound *	Rub and put on the sore area.
Senna singueana (Delile) Lock (Fabaceae)	Hambo-hambo	S	Bark	Evil eye	Dip the leaves of *Rumex nervosus i*n water and use this to wash the whole body.
Medicago polymorpha L. (Fabaceae)	Teneg	H	Root	Abdominal pain	Chew the fluid and then swallow it.
Sida ovata Forssk (Malvaceae)	Dekidaero	H	Leaf, root	Inflammatory Wounds	Crush and mix with water, then put on the sore spot.
Justicia schimperiana (Hochst.exNees) T. Anders. (Acanthaceae)	Shimieza	S	Leaf	Jaundice (yewef beshta)	Crush and filter the juice part and drink half of a liter depending on age.
Acacia etbaica Schweinf. (Fabaceae)	Seraw	T	Steam Bark	Dislocated bone *	Secure the dislocated bone by wrapping it with a bandage.
Argemone mexicana L. (Papaveraceae)	Eshok tilian,	H	Latex	Blooding	Cut a leaf and squeeze the latex onto the wound.
Sarcostemma viminale (L.) R.Br. (Asclepiadaceae)	Halengi hibey	C	Leaf	Evil eye	Soak it in water and wash the body with it.
Jasminium gratissimum Deflers (Oleaceae)	Habi tselim	C	Root	Evil sprit	Crush and mix with the roots of *Carissa spinarum*, then burn it to fumigate.
Maytenus senegalensis (Lam.) Excell. (Celastraceae)	Argudi	T	Stem	Stomach ache	Break the stem, add water, strain it, and then drink.
Maytenus arbutifolia (A. Rich.) Wilczek (Celastraceae)	Atat	S	Root	Itching	Boil the root in water and use it to wash your body.
Solanum incanum L. (Solanaceae)	Nieshet on engule	S	Root	External wound	Dry, grind and apply on affected part.
			bark	Anthrax **	Mix crush with seeds of *Lepidium sativum*, whole parts of *Hypoestes forskaolii*, roots of *Achyranthes aspera*, and *Verbascum sinaiticum*. Strain the mixture and drink the liquid.

Hetromorpha arborescens (Spreng) Cham &Schltdl. (Appiaceae)	Mirkus zibei	T	Leaf	Febrile illness	Boil it in water by mixing with leaves of *Eucalyptus globulus* and inhale the vapor
Stereospermum kunthianum Cham. (Bignoniaceae)	Adgi zana	T	Bark	Broken body part	Crush and tie on the affected part.
Phytolacca dodecandra (Forssk.) (Phytolaccaceae)	Shibti	C	Hole	Abortion	Crush, filter and drink one coffee cup of the fluid in the morning.
				Abdominal	Crush, filter and drink it mixing with water or milk.
				Bloating	Crush, filter and drink the fluid.
Erythrina abyssinica Lam. ex DC. (Fabaceae)	Zibabeo	T	Root bark	Tinea capitis	Crush, mix it with butter and apply on the affected part.
Cynoglossum lanceolatum Forssk. (Boraginaceae)	Dekik teneg	H	Leaf	Ear defect	Add a drop of squeezed liquid through ear
Acokantheria schimperi (ADC) Schweinf (Apocynaceae)	Mebtie	T	Fruit	Arthritis/ Rheumatism	Pound, mix with water and cream the paste.
Pisum sativum L.(Fabaceae)	Ayni ater	H	Seed	Blood circulation	Pound and mix water and swallowing the liquid
Cicer arietinum L.(Fabaceae)	Qeyih ater	H	Pod	Wood healing	Use the salt nature of the pond on the wounded part of the body
Linum usitatissimum L. (Linaceae)	Entatie	H	Seed	Intestinal constipation	Grind the seed and mix it with water and eat with enjera or drink alone
Mimusops kummel Bruce ex A.DC(sapotaceae)	Kumel	T	Fruit	Abdominal discomfort	Eat the raw ripped fresh fruit
Vernonia amygdalina Del. (Asteracae)	Grawa	T	Fruit	Constipation	Eat the fruit with sugar or alone
Psidium guajava L. (Myrtaceae)	Zeytuhun	S	Bark	Evil eye	burn the dry part of the barck and fumigate under the smoke
Acacia polyacantha (Hochst.ex.A.Rich)Kyal & Botwar (Fabaceae)	Gumero	T	Bark	Abdominal pain	Grind the soft internal part of the bark and squeezing and drink the liquid alone or with salt, sugar and milk
Ficus glumosa Delile (Moraceae)	Tseqente	T	Latex	Wound healing	Use or apply the latex on the wounded part
Conium maculatum L.(Apiaceae)	Tsadqan	H	Seed	Intestinal parasite	Mix the grinded seed with water and drink the liquid
Grewia ferruginea Hochst.ex A.Rich (Tiliaceae)	Tsinquayit	T	Leave	Anti-dandruff	Grind or pound the leave and squeeze the liquid and cream on the infected part of the body
Polygala abysstnic R.Br.exFresen (Polygalaceae)	Fewsi enqrbit	H	Root	Scorpion bite healing	Grind and swallow the liquid
Gutenbergia rueppellii Sch.Bip. (Asteraceae)	Mereret	H	Leave	Anti-malaria	Grind the leave and swallow the liquid
Guizotia abyssinica (L.f) Cass. (Asteraceae)	Nihug	H	Seed	Constipation	Pound the roasted seed, mix in water & squeeze, drink the liquid.

Conclusion

The study revealed that residents of Laelay Koraro and Zana Woredas possess extensive knowledge of medicinal plants. The threat to plant diversity appears minimal, as their collection

methods mainly involve harvesting shrubs and leaves rather than roots or entire plants, which are more critical for sustainability. Evidence of this is seen in the fact that few locals cultivate medicinal plants in their gardens. Additionally, men tend to identify a greater variety of therapeutic plants than women, especially those located farther from medical facilities. Not all medicinal plants hold equal importance; some are primarily used by the community to treat the same ailments. This shared knowledge has been gained through extensive experience, allowing locals to distinguish the most effective plants for treating illnesses in both humans and livestock. The study also revealed that various human activities are exerting significant pressure on many wild medicinal plant species. *Acaia Lehai* is the most endangered medicinal plant, primarily due to agricultural expansion. *Lepidium sativum* is the preferred remedy for treating febrile illnesses. *Cordia africana* is a versatile plant that is also valued for its medicinal properties. The most common methods of application involve internal and oral administration, with citation rates of 0.61 and 0.48 respectively for the use of these remedies.

Additionally, the declining interest among the younger generation in traditional medicine raises concerns about the future of local medicinal plant knowledge and associated expertise. Given the hurrying level of biodiversity damage and the intensifying impacts of climate change, it is authoritative that protection efforts are ramped up considerably. Reinforcement and growing preservation initiatives is indispensible not only for conservation the elaborate web of life that tolerates all ecosystems but also for alleviating the confrontational effects of weather change on our planet. These efforts are essential for conserving healthy surroundings, preservative threatened species, and safeguarding the elasticity of ecosystems in the face of conservational tensions. Moreover, strengthened conservation engagements strengthen viable development by indorsing the liable use of natural resources, supporting local and global economies, and

encouragement a stable coexistence between human communities and nature. Identifying the interconnectedness of biodiversity health and climate stability acmes the imperative need for increased focus and investment in conservation strategies worldwide to safe a sustainable future for groups to come.

Finally, safeguarding medicinal plants through both in situ and ex situ conservation methods should be a primary focus for development agents involved in plant preservation. To ensure the survival of these plants and the retention of traditional knowledge, government agencies must prioritize efforts to mitigate threats such as firewood collection and agricultural expansion. The pharmaceutical verification of their efficacy should take in consideration for the future studies.

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