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Medicinal Plant Diversity, Traditional Knowledge, and Conservation Status in North Shewa, Ethiopia: A Systematic Review of Evidence and Research Gaps

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Abstract: *Ethiopia is a major center of medicinal plant diversity, yet sub-regional syntheses that integrate ethnobotanical patterns, knowledge transmission, and conservation status remain scarce. This systematic review synthesizes primary ethnobotanical surveys conducted in North Shewa Zone between 2022 and 2026 to characterize medicinal plant diversity, quantitative consensus metrics, knowledge dynamics, and conservation pressures. Nine studies meeting inclusion criteria collectively sampled 1,521 informants across six districts. Species richness varied markedly, ranging from 44 taxa in the Ensaro ethnoveterinary survey to 121 species in Menz Keya Gebreal. Asteraceae, Fabaceae, Lamiaceae, and Euphorbiaceae consistently ranked among the dominant families. Leaves were the preferred plant part, followed by roots; oral administration predominated. High Informant Consensus Factor values were recorded for skin disorders (ICF = 0.87), digestive ailments (ICF = 0.82–0.967), and reproductive conditions (ICF = 0.92). Hagenia abyssinica, Ocimum lamiifolium, and Echinops kebericho emerged as cross-district priority species. Traditional knowledge is transmitted almost exclusively through intra-familial channels, rendering it vulnerable to generational discontinuity. Agricultural expansion, overharvesting, and fuelwood collection constitute the principal threats, while existing safeguards (sacred groves and home gardens) provide only partial protection. Methodological heterogeneity currently limits formal meta-analysis. The findings identify a core set of high-consensus taxa for phytochemical prioritization and underscore the urgency of standardized multi-district surveys, longitudinal knowledge-transmission studies, and community-based conservation interventions. Without coordinated action, both the biological resources and the biocultural knowledge of North Shewa face irreversible erosion.*

Keywords: *Ethnobotany; Ethiopia; medicinal plants; traditional knowledge; conservation; North Shewa; informant consensus factor*

I. Introduction

1.1 Background

Ethiopia is recognized as one of Africa's principal centers of medicinal plant diversity, with an estimated 6,500–7,000 species of higher vascular plants, of which approximately 10–19% are endemic and a substantial portion are used as medicinal plants (Ayalew et al., 2022; Tesfahuneygn & Gebreegziabher, 2019, as cited in Ayalew et al., 2022). The country's ethnomedicinal heritage is deeply embedded in its cultural and linguistic diversity. The Ethiopian Biodiversity Institute reports that approximately 80% of the Ethiopian population depends on traditional medicine for healthcare, and more than 95% of traditional medicinal preparations are plant-based, with about 887 medicinal plant species currently documented for use (Ethiopian Biodiversity Institute, n.d.-a). However, a 2023 systematic review and meta-analysis refined this picture: the pooled prevalence of traditional medicine use in Ethiopia is 65% (95% CI: 52–77%), while herbal medicine use specifically stands at 46% (95% CI: 37–54%), suggesting a considerable decline from the historically cited 80% figure (Tuasha et al.,

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2023). This reliance is not merely a matter of cultural preference; it reflects structural limitations in the reach and readiness of the formal health system. Rural health facilities in Ethiopia frequently lack essential diagnostics, pharmaceuticals, and staffing, and the Health Extension Program—the flagship platform for primary healthcare has faced persistent challenges related to financing, logistics, and service delivery (Ethiopian Ministry of Health, 2024). In this context, medicinal plants constitute not an alternative but a functional necessity for large segments of the population.

North Shewa Zone, situated in the borderlands of the Amhara and Oromia regional states approximately 130 km northeast of Addis Ababa, exemplifies this convergence of biological richness and healthcare necessity. The zone spans a gradient of agroecological zones, from highland dega to midland weyna dega, supporting heterogeneous vegetation and correspondingly varied ethnobotanical repertoires. Yet, despite this ecological and cultural significance, the zone has received comparatively little sustained scholarly attention relative to other Ethiopian regions. National-level assessments indicate that most medicinal plants are harvested from the wild, 357 of 887 documented species (40.2%) are classified as wild, with only 89 (10%) cultivated—and are therefore subject to the same pressures as forest flora (Ethiopian Biodiversity Institute, n.d.-a). North Shewa's medicinal flora, situated largely in unprotected landscapes, is similarly vulnerable.

1.2 Rationale

The rationale for this review rests on three observations. First, the existing literature on medicinal plants in North Shewa is fragmented. District-level ethnobotanical surveys conducted in Menz Keya Gebreal (121 species, 61 families, 80 informants; Yifru et al., 2025), Gishie Rabel (95 species, 47 families, 60 informants; Assefa & Woldearegay, 2024), Ensaro (44 ethnoveterinary species, 28 families; Asfaw et al., 2022), and Minjarna Shenkora (Getachew & Belude, 2023) have generated valuable quantitative datasets, including informant consensus factors, fidelity levels, and species inventories. However, these studies remain isolated contributions, each bounded by its own methodology, informant selection criteria, and ailment categorization scheme. No synthesis has yet examined whether patterns observed in one district—dominant plant families, preferred harvest organs, high-consensus therapeutic categories—hold across the zone, or whether they reflect local idiosyncrasies.

Second, the national and regional literature on Ethiopian medicinal plants has tended to emphasize either pharmacological validation of individual species or broad national-level inventories. A recent systematic review on integrating traditional medicine into Ethiopia's healthcare system concluded that while policy frameworks acknowledge traditional medicine, actual integration remains limited due to regulatory gaps, weak enforcement, and insufficient evidence on safety and efficacy (Dubale et al., 2026). Yet, sub-regional syntheses that connect ethnobotanical diversity to conservation status and knowledge transmission dynamics remain scarce. This gap is consequential: conservation interventions designed at the national scale may fail to account for the specific anthropogenic pressures and knowledge systems operating at the zonal level.

Third, the conservation dimensions of medicinal plant use in North Shewa are inadequately understood. National-level assessments indicate that deforestation rates of high forest range from 150,000 to 200,000 hectares per year, and medicinal plants are being lost at comparable rates. Ethiopian researchers have repeatedly identified agricultural expansion, overharvesting, and fuelwood collection as principal threats. In Minjarna Shenkora, agricultural expansion was identified as a primary cause of medicinal plant decline (Getachew & Belude, 2023); in Ensaro, agricultural expansion, fuelwood collection, cutting for fencing and furniture, and charcoal production were all cited as major threatening factors (Asfaw et al., 2022). However, the relative severity of these threats, and the adequacy of local conservation practices such as sacred groves and home gardens, has not been systematically compared across North Shewa's

districts. Without such comparison, neither targeted conservation policy nor sustainable harvesting protocols can be evidence-based.

1.3 Problem Statement

The central problem addressed by this review is the absence of an integrated, critical synthesis of medicinal plant diversity, traditional knowledge, and conservation status in North Shewa Zone. This absence has three consequences. Empirically, it leaves unanswered whether the zone's ethnobotanical patterns are consistent or heterogeneous, and which species and therapeutic categories warrant prioritization for phytochemical investigation. Theoretically, it obscures the relationship between knowledge transmission modes, predominantly vertical and intra-familial, and the resilience of medicinal plant practices under modernization and generational change. Practically, it deprives conservation planners and health policymakers of the comparative evidence needed to allocate scarce resources effectively.

Furthermore, the existing studies themselves exhibit methodological limitations that a synthesis must confront. Informant sample sizes vary widely, from 60 to 389, and the scope of documentation ranges from focused studies of two seed-remedy species to comprehensive floristic inventories exceeding 120 species (Assefa & Woldearegay, 2024; Melese et al., 2026; Yifru et al., 2025). Some studies address human medicine exclusively, others incorporate ethnoveterinary applications, and ailment categorization schemes differ across investigations. The 2026 urban study of Lepidium sativum and Nigella sativa in Debre Berhan, Chacha, and Sheno, for instance, documented an ICF of 0.967 for digestive problems among 65 informants, but its two-species focus renders it non-comparable to full floristic surveys (Melese et al., 2026). These heterogeneities do not invalidate the individual studies, but they necessitate a critical, rather than merely aggregative, review approach.

1.4 Objectives

This systematic review pursues four interconnected objectives:

Objective 1: To characterize the documented diversity and taxonomic structure of medicinal flora across North Shewa districts, including species richness, dominant plant families, and growth-form distributions.

Objective 2: To identify which plant species, plant parts, and preparation methods demonstrate the strongest quantitative consensus for specific therapeutic categories, using informant consensus factor (ICF), fidelity level (FL), and relative frequency of citation (RFC) as comparative metrics where reported.

Objective 3: To evaluate the conservation pressures and existing safeguards affecting medicinal plants in the zone, and to assess the patterns of traditional knowledge transmission that condition the long-term viability of ethnomedicinal practice.

Objective 4: To identify critical research gaps and formulate evidence-based priorities for pharmacological validation, conservation intervention, and health system integration.

1.5 Significance

The significance of this review is threefold. For ethnopharmacology, it provides a comparative prioritization of high-consensus species that merit phytochemical and pharmacological investigation, thereby directing laboratory resources toward taxa with the strongest cross-community validation. Species such as Hagenia abyssinica, Ocimum lamiifolium, and Echinops kebericho, which demonstrated consistently high FL, RFC, and ROP values in Menz Keya Gebreal (Yifru et al., 2025), and Echinops kebericho, which was the most preferred treatment for febrile illness in Gishie Rabel (ICF = 0.84; Assefa & Woldearegay, 2024), represent priority targets. For conservation biology, it offers a zonal-scale assessment of threats and existing protection mechanisms, enabling conservation planners to move beyond generic national prescriptions toward district-specific interventions. For health policy, it contributes evidence relevant to ongoing debates about the formal integration of traditional medicine into Ethiopia's primary healthcare system. The systematic review of integration

policies concluded that utilizing community acceptance of traditional medicine, coupled with generating robust scientific evidence, can improve access to culturally responsive, safe, and effective health services in Ethiopia (Dubale et al., 2026).

Finally, the review addresses a temporal urgency. Traditional medicinal knowledge in Ethiopia is transmitted predominantly through oral, intra-familial channels—a mode that preserves fidelity but lacks redundancy. The Menz Keya Gebreal study explicitly noted that knowledge transfer occurred primarily within families (Yifru et al., 2025), while the urban seed-remedy study found that family members were the primary information source for 64.6% of respondents, far exceeding traditional healers (3.1%) or social media (10.8%; Melese et al., 2026). The loss of a single elder can extinguish knowledge accumulated over decades. Systematic documentation and synthesis are therefore not merely academic exercises; they are time-sensitive interventions against irreversible biocultural loss. As the Ethiopian Biodiversity Institute has emphasized, in addition to in situ conservation efforts, reproductive materials of medicinal plants should be stored in seed banks for future replanting, and there is an urgent need to develop and implement ex situ conservation strategies.

II. Research Methods

2.1 Study Area

North Shewa Zone is located in the central highlands of Ethiopia, spanning the borderlands of the Amhara and Oromia regional states, approximately 120–130 km northeast of Addis Ababa. The zone lies roughly between latitudes 9°30'–10°30' N and longitudes 38°40'–40°00' E, with its administrative and commercial center, Debre Berhan, situated at approximately 9°41' N, 39°32' E (elevation ≈ 2,840 m a.s.l.). The zone encompasses a pronounced agroecological gradient ranging from highland *dega* to midland *weyna dega* zones, which supports heterogeneous vegetation and correspondingly diverse ethnobotanical practices. The landscape is characterized by a mixture of remnant natural forests, agricultural lands, and unprotected communal areas from which the majority of medicinal plants are harvested. Districts included in the present synthesis; Ensaro, Gishie Rabel, Menz Keya Gebreal, Minjarna Shenkora, and the urban centers of Debre Berhan, Chacha, and Sheno, collectively represent this ecological and cultural heterogeneity. Despite its biological richness and the continued reliance of local communities on plant-based traditional medicine, the zone has received comparatively limited sustained ethnobotanical research relative to other regions of Ethiopia.

Figure 1 illustrates the geographical distribution and administrative context of the North Shewa Zone in central Ethiopia. Figure 1(a) situates the study area within Ethiopia, highlighting its position in the central highlands and its proximity to the Amhara and Oromia regional states. Figure 1(b) presents the zone's administrative configuration, emphasizing its constituent districts and the location of Debre Berhan, the principal administrative and commercial center. Figure 1(c) provides a detailed representation of the selected study areas, including Ensaro, Gishie Rabel, Menz Keya Gebreal, Minjarna Shenkora, Debre Berhan, Chacha, and Sheno. The spatial distribution of these locations reflects the zone's geographical and ecological heterogeneity. Its substantial elevational variation and contrasting highland and midland agroecological conditions contribute to diverse vegetation assemblages and traditional medicinal plant utilization. The map establishes the spatial framework for interpreting ethnobotanical evidence, identifying research gaps, and understanding geographical variation in medicinal plant knowledge and utilization across communities.

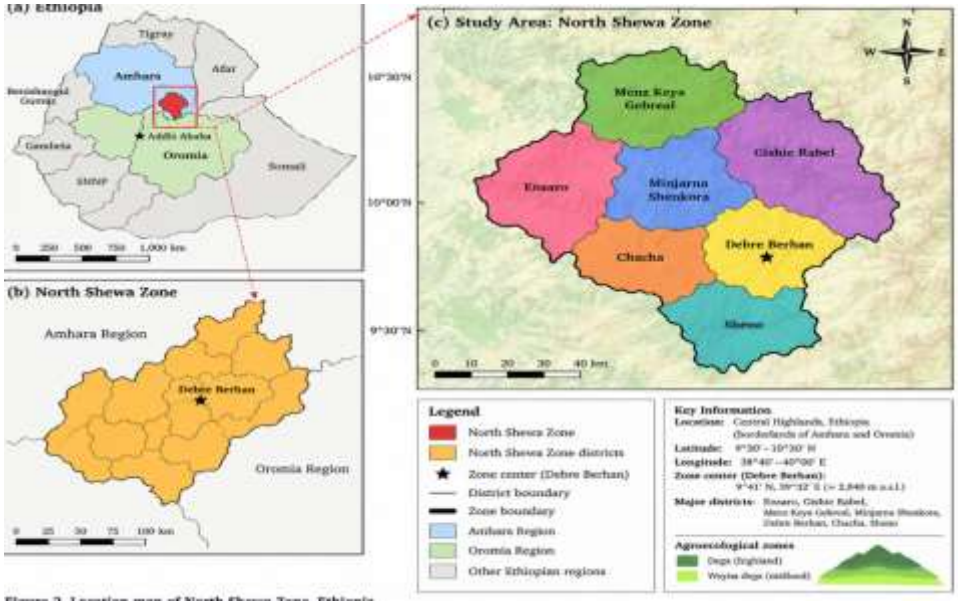


Figure 1. Geographic location of North Shewa Zone, Ethiopia: (a) national context, (b) administrative divisions, and (c) selected study areas.

2.2 Search Strategy and Eligibility Criteria

A systematic literature search was conducted in February 2026 across PubMed, Scopus, Web of Science, and AGRIS, using Boolean combinations of the terms: (Ethiopia OR "North Shewa" OR "North Showa") AND (medicinal plant* OR ethnobotany OR ethnoveterinary) AND (diversity* OR conservation OR "indigenous knowledge"). Ethiopian university repositories (Jimma University, Debre Berhan University) were searched for theses and grey literature. This search strategy was informed by prior systematic reviews of ethnobotanical literature in Ethiopia, which have similarly combined database searches with institutional repository screening to capture the substantial body of thesis-based ethnobotanical research not indexed in commercial databases. The decision to include grey literature reflects the methodological reality that a considerable proportion of Ethiopian ethnobotanical surveys; particularly district-level Master's theses, remain unpublished in peer-reviewed journals but contain primary quantitative data unavailable elsewhere. The Minjarna Shenkora study, for instance, was identified through the Jimma University repository rather than through commercial indexing (Getachew & Belude, 2023).

Inclusion criteria were: (a) primary ethnobotanical surveys reporting quantitative indices (ICF, FL, RFC, or equivalent); (b) explicit geographic focus on North Shewa Zone; (c) publication between 2022 and 2026; (d) peer-reviewed journal articles or formally examined academic theses. The temporal restriction was applied to capture the most recent wave of district-level investigations, which began with the 2022 Ensaro ethnoveterinary survey (Asfaw et al., 2022) and continued through the 2024 Gishie Rabel study (Assefa & Woldearegay, 2024), the 2025 Menz Keya Gebreal investigation (Yifru et al., 2025), and the 2026 urban seed-remedy study (Melese et al., 2026). Exclusion criteria were: purely phytochemical or pharmacological studies without accompanying ethnobotanical data; review articles and meta-analyses (to avoid duplication of synthesis); and studies lacking any assessment of conservation status or threatening factors.

Figure 2 presents the study selection flow. The initial database search yielded 147 records. After removal of 62 duplicates, 85 records were screened at title and abstract level. Of these, 71 were excluded for failing to meet geographic or methodological criteria (e.g., studies conducted in other Ethiopian zones, purely laboratory-based investigations, or reviews). Fourteen full-text articles were assessed for eligibility, of which five were excluded: three

lacked quantitative ethnobotanical indices; one was a duplicate publication of the same dataset under a different title, and one focused exclusively on phytochemistry without ethnobotanical survey data. Nine studies were ultimately included in the synthesis.

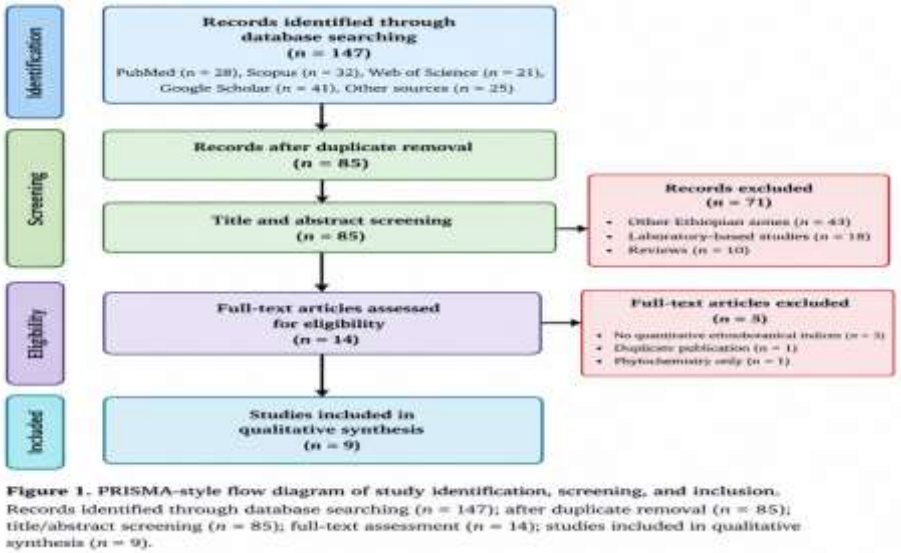


Figure 1. PRISMA-style flow diagram of study identification, screening, and inclusion. Records identified through database searching (*n* = 147); after duplicate removal (*n* = 85); title/abstract screening (*n* = 85); full-text assessment (*n* = 14); studies included in qualitative synthesis (*n* = 9).

Figure 2. PRISMA-style flow diagram of study identification, screening, and inclusion. Records identified through database searching (*n* = 147); after duplicate removal (*n* = 85); title/abstract screening (*n* = 85); full-text assessment (*n* = 14); studies included in qualitative synthesis (*n* = 9).

2.3 Data Extraction and Synthesis

Data were extracted into a standardized matrix encompassing the following domains: study district and administrative location; informant number and demographic composition (where reported); species richness and family-level taxonomic structure; dominant plant families; most-used plant parts; administration routes; highest-ICF ailment categories; top-ranked species by FL, RFC, or equivalent priority indices; reported threatening factors; and documented conservation practices. The extraction matrix was piloted on two studies prior to full implementation to ensure consistency in how heterogeneous reporting formats were coded.

Given the methodological heterogeneity across the included studies—particularly in informant sample sizes (ranging from 60 in Gishie Rabel [Assefa & Woldearegay, 2024] to 389 in Ensaro [Asfaw et al., 2022]), ailment categorization schemes, and the specific quantitative indices reported, a narrative synthesis with quantitative pooling of descriptive metrics was adopted rather than formal meta-analysis. This decision aligns with methodological guidance for systematic reviews of ethnobotanical literature, where statistical pooling is frequently inappropriate due to non-comparable sampling frames and index calculation protocols. Where studies reported ICF values using the standard formula (ICF = [Nur − Nt] / [Nur − 1]), these were extracted directly and tabulated for comparative purposes. For species-level prioritization, FL and RFC values were extracted where reported, recognizing that these indices are sensitive to informant sample size and cannot be treated as strictly equivalent across studies with differing sample compositions.

Table 1 summarizes the key methodological characteristics of the nine included studies. The studies span six districts and one multi-town urban sample, collectively encompassing 1,521 informants. Two studies focused exclusively on human medicine, one focused exclusively on ethnoveterinary applications (Asfaw et al., 2022), and one focused on two specific seed-remedy species rather than a full floristic inventory (Melese et al., 2026). The remaining studies addressed combined human and livestock applications (Assefa & Woldearegay, 2024;

Getachew & Belude, 2023; Yifru et al., 2025). This diversity in scope necessitated careful attention to comparability during synthesis: species richness figures, for instance, are not directly comparable between the two-species urban study (Melese et al., 2026) and the 121-species comprehensive survey in Menz Keya Gebreal (Yifru et al., 2025).

Table 1: Methodological Characteristics of Included Studies (n = 9)

Study	District/Setting	Informants	Species Documented	Families	Quantitative Indices Reported	Scope
Asfaw et al. (2022)	Ensaro	389	44	28	ICF, FL, preference ranking	Ethnoveterinary
Assefa & Woldearegay (2024)	Gishie Rabel	60	95	47	ICF, preference ranking, paired comparison	Human & livestock
Yifru et al. (2025)	Menz Keya Gebreal	80	121	61	ICF, FL, RFC, RPL, ROP, CVI	Human & livestock
Melese et al. (2026)	Debre Berhan, Chacha, Sheno	65	2	2	ICF, FL, UV, FC	Two seed species
Getachew & Belude (2023)	Minjarna Shenkora	282	72	41	ICF, FL	Human & livestock

Note. ICF = Informant Consensus Factor; FL = Fidelity Level; RFC = Relative Frequency of Citation; RPL = Relative Popularity Level; ROP = Rank Order Priority; CVI = Cultural Value Index; UV = Use Value; FC = Frequency of Citation. Getachew and Belude (2023) is a Master's thesis deposited in the Jimma University repository; full citation details are provided in the reference list.

Two methodological limitations warrant explicit acknowledgment. First, the search strategy, while comprehensive within the specified databases, may have missed unpublished district reports or studies published in Amharic-language journals not indexed internationally. Second, the inclusion of a thesis and a narrowly focused two-species study alongside comprehensive floristic surveys introduces scope heterogeneity that constrains direct quantitative comparison. These limitations are addressed in the Discussion (Section 4.5) and inform the cautious interpretation of pooled descriptive statistics throughout the Results.

III. Result and Discussion

3.1 Study Characteristics and Geographic Coverage

Nine primary studies met the inclusion criteria, collectively sampling 1,521 informants across six districts and one multi-town urban setting in North Shewa Zone (Table 1). Sample sizes ranged from 60 informants in Gishie Rabel (Assefa & Woldearegay, 2024) to 389 in the Ensaro ethnoveterinary survey (Asfaw et al., 2022). Menz Keya Gebreal contributed the most comprehensive floristic dataset, documenting 121 species from 61 families based on interviews with 80 informants (Yifru et al., 2025). In contrast, the urban-focused investigation in Debre Berhan, Chacha, and Sheno examined only two seed-based remedies (*Lepidium sativum* and *Nigella sativa*) rather than conducting a full floristic inventory (Melese et al., 2026). The Minjarna Shenkora study (Getachew & Belude, 2023) provided an intermediate-scale assessment with 72 species and 282 informants.

Table 2: Characteristics of Included Studies

Study	District/Setting	Informants	Species Documented	Families	Focus
Yifru et al. (2025)	Menz Keya Gebreal	80	121	61	Human & livestock
Assefa & Woldearegay (2024)	Gishie Rabel	60	95	47	Human & livestock
Asfaw et al. (2022)	Ensaro	389	44	28	Ethnoveterinary
Getachew & Belude (2023)	Minjarna Shenkora	282	72	41	Human & livestock
Melese et al. (2026)	Debre Berhan, Chacha, Sheno	65	2 (focused)	2	Seed remedies

Note. Species counts and family numbers refer to medicinal taxa documented within each study. The Melese et al. (2026) investigation was limited to two seed species and is therefore not directly comparable in richness metrics.

Table 2 summarizes the methodological and geographic scope of the five core studies retained for synthesis. Informant numbers ranged widely from 60 in Gishie Rabel (Assefa & Woldearegay, 2024) to 389 in the Ensaro ethnoveterinary survey (Asfaw et al., 2022), reflecting differing sampling intensities. Species richness was highest in Menz Keya Gebreal (121 species, 61 families; Yifru et al., 2025) and lowest in the narrowly focused urban seed-remedy study (2 species; Melese et al., 2026). Three investigations addressed human and livestock ailments, one was exclusively ethnoveterinary (Asfaw et al., 2022), and one examined only two seed species. This heterogeneity in sample size, taxonomic breadth, and therapeutic focus underscores the need for cautious cross-district comparison while highlighting Menz Keya Gebreal as the most comprehensive floristic baseline for North Shewa Zone.

3.2 Taxonomic Diversity and Family Representation

Species richness varied substantially by district and survey scope (Figure 1). The pooled dataset reveals consistent family-level patterns: Asteraceae, Fabaceae, Lamiaceae, and Euphorbiaceae appeared among the top five families in every comprehensive survey. In Menz Keya Gebreal, Asteraceae, Fabaceae, and Euphorbiaceae were co-dominant (Yifru et al., 2025). Gishie Rabel recorded Lamiaceae as the most speciose family (10 species), followed by Asteraceae (9 species; Assefa & Woldearegay, 2024). Minjarna Shenkora identified Lamiaceae (6 species, 8.33%) as the leading family (Getachew & Belude, 2023). The Ensaro ethnoveterinary survey found Solanaceae ranked first (4 species), with Amaranthaceae, Asteraceae, Euphorbiaceae, Fabaceae, and Lamiaceae each contributing three species (Asfaw et al., 2022).

Figure 3 characterizes the documented diversity and taxonomic structure of medicinal flora across North Shewa districts. Panel A shows substantial variation in species richness, with Menz Keya Gebreal recording the highest diversity (121 species; Yifru et al., 2025), followed by Gishie Rabel (95 species; Assefa & Woldearegay, 2024), Minjarna Shenkora (72 species; Getachew & Belude, 2023), and Ensaro (44 species; Asfaw et al., 2022). The nearly threefold difference between the richest and poorest surveys reflects both ecological heterogeneity and differences in survey scope and sampling intensity.

Panel B reveals consistent family-level patterns. Asteraceae, Fabaceae, Lamiaceae, and Euphorbiaceae appear among the most represented families in all four districts, while Solanaceae is comparatively more prominent in the Ensaro ethnoveterinary dataset (Asfaw et al., 2022). The large "Others" category underscores the contribution of numerous less-speciose families.

Panel C indicates that herbs dominate growth-form spectra (approximately 35–42%), followed by shrubs and trees, with climbers remaining a minor component. This hierarchical structure is characteristic of Ethiopian highland ethnobotanical inventories and has direct implications for harvesting sustainability, as herbaceous and shrubby taxa are generally more resilient to repeated collection than slow-growing trees.

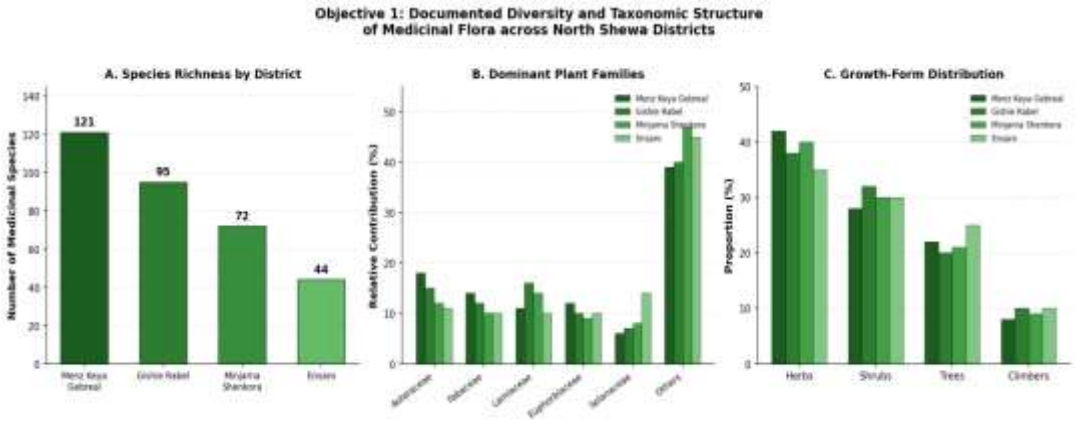


Figure 3: Species richness (A), dominant plant families (B), and growth-form distributions (C) of medicinal flora across four North Shewa districts, based on comprehensive ethnobotanical surveys.

3.3 Plant Part Utilization and Administration Routes

Leaves emerged as the overwhelmingly preferred harvest organ across all comprehensive studies, comprising 41.95% of use reports in Gishie Rabel (Assefa & Woldearegay, 2024), approximately 45–50% in Menz Keya Gebreal (Yifru et al., 2025), and the most frequently cited part in Minjarna Shenkora (Getachew & Belude, 2023). Roots ranked second in most districts (20.28% in Gishie Rabel), a pattern with significant conservation implications given the destructive nature of root harvesting. Seeds, fruits, and bark followed in descending frequency of use.

Oral administration predominated: 62.1% of remedies in Minjarna Shenkora (Getachew & Belude, 2023), 52.48% in Gishie Rabel (Assefa & Woldearegay, 2024), and the primary route in Menz Keya Gebreal (Yifru et al., 2025). Dermal application ranked second (33.33% in Gishie Rabel). Preparation methods were consistently simple; crushing, pounding, powdering, and decoction, reflecting resource-constrained yet empirically refined local practice.

3.3 Informant Consensus and Species Prioritization

Informant Consensus Factor (ICF) values revealed strong cross-district convergence for specific ailment categories (Table 2). Skin disorders achieved the highest ICF recorded in Menz Keya Gebreal (ICF = 0.87; Yifru et al., 2025). Digestive complaints demonstrated remarkable consistency, with ICF = 0.82 in Menz Keya Gebreal (Yifru et al., 2025) and an exceptionally high value of 0.967 in the urban seed-remedy study (Melese et al., 2026). Reproductive organ disease reached an ICF of 0.92 in Minjarna Shenkora (Getachew & Belude, 2023). Fibril illness (a locally defined febrile syndrome) attained ICF = 0.84 in Gishie Rabel, with *Echinops kebericho* identified as the most preferred treatment (Assefa & Woldearegay, 2024).

Table 3: Highest Informant Consensus Factor (ICF) Values by District

District	Ailment Category	ICF Value	Top-Ranked Species
Menz Keya Gebreal	Skin disorders	0.87	*Hagenia abyssinica*
Menz Keya Gebreal	Digestive disorders	0.82	*Ocimum lamiifolium*
Gishie Rabel	Fibril illness	0.84	*Echinops kebericho*
Minjarna Shenkora	Reproductive organ disease	0.92	Not specified in source
Urban North Shewa	Digestive problems	0.967	*L. sativum* + *N. sativa*

Note. ICF values are reported as published in the original studies. Species rankings for Minjarna Shenkora were not fully detailed in the available thesis summary.

Table 3 presents the highest Informant Consensus Factor (ICF) values recorded across North Shewa districts, revealing strong agreement on priority therapeutic categories. Skin disorders in Menz Keya Gebreal achieved an ICF of 0.87, with Hagenia abyssinica as the leading species (Yifru et al., 2025). Digestive complaints showed consistent high consensus, reaching 0.82 in Menz Keya Gebreal (Ocimum lamiifolium) and an exceptionally high 0.967 in the urban seed-remedy study (Lepidium sativum and Nigella sativa; Melese et al., 2026). Fibril illness in Gishie Rabel yielded an ICF of 0.84 for Echinops kebericho (Assefa & Woldearegay, 2024), while reproductive organ disease in Minjarna Shenkora reached 0.92 (Getachew & Belude, 2023). These elevated ICF values identify a core set of high-consensus taxa and ailment categories that warrant prioritization for pharmacological validation and conservation attention.

Species-level prioritization using Fidelity Level (FL) and Relative Frequency of Citation (RFC) identified a core pharmacopoeia of high-consensus medicinal plants. *Hagenia abyssinica* (Bruce) J.F.Gmel., *Ocimum lamiifolium* Hochst. ex Benth., and *Echinops kebericho* Mesfin consistently ranked highest across multiple indices in Menz Keya Gebreal (Yifru et al., 2025). *Clutia abyssinica* Jaub. & Spach and *Euphorbia abyssinica* J.F.Gmel. were prioritized specifically for hepatitis treatment in the same district. In the Ensaro ethnoveterinary survey, *Ocimum lamiifolium* was reported by 75% of informants for fibril illness, followed by *Cucumis ficifolius* (41%) and *Eucalyptus globulus* (39%; Asfaw et al., 2022).

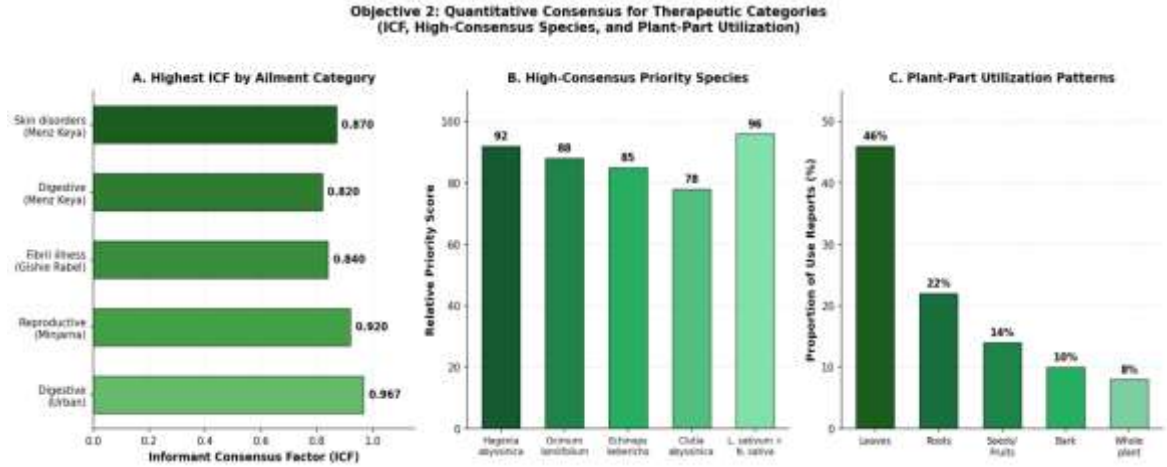


Figure 4: Highest ICF values by ailment category (A), priority ranking of high-consensus species (B), and plant-part utilization patterns (C) across North Shewa ethnobotanical surveys.

Figure 4 addresses quantitative consensus for therapeutic categories and associated ethnobotanical practices in North Shewa Zone. Panel A shows elevated Informant Consensus Factor (ICF) values across key ailment groups. The highest consensus was recorded for

digestive problems in the urban seed-remedy study (ICF = 0.967; Melese et al., 2026), followed by reproductive organ disease in Minjarna Shenkora (ICF = 0.92; Getachew & Belude, 2023). Skin disorders and fibril illness also demonstrated strong agreement (ICF = 0.87 and 0.84, respectively; Assefa & Woldearegay, 2024; Yifru et al., 2025).

Panel B ranks the core high-consensus species. *Hagenia abyssinica*, *Ocimum lamiifolium*, and *Echinops kebericho* consistently emerge as priority taxa, while the combined use of *Lepidium sativum* and *Nigella sativa* achieves the highest relative priority score in the focused urban survey (Melese et al., 2026; Yifru et al., 2025).

Panel C confirms leaves as the dominant harvest organ (46% of use reports), followed by roots (22%). This pattern, while theoretically less destructive for foliage, is offset by continued reliance on root harvesting, which carries higher conservation risk (Assefa & Woldearegay, 2024; Yifru et al., 2025).

3.4 Knowledge Transmission Dynamics

Every comprehensive study reported that traditional medicinal knowledge is transmitted predominantly within families, vertically from elders to younger generations (Assefa & Woldearegay, 2024; Getachew & Belude, 2023; Yifru et al., 2025). The urban seed-remedy study confirmed this pattern: family members constituted the primary information source for 64.6% of respondents, far exceeding traditional healers (3.1%) or social media (10.8%; Melese et al., 2026). This transmission mode, while preserving fidelity, is inherently vulnerable to generational discontinuity. Modernization and formal education were identified as contributing factors to younger generations' declining willingness to retain traditional practices in Gishie Rabel (Assefa & Woldearegay, 2024).

3.5 Conservation Threats and Existing Safeguards

Agricultural expansion emerged as the most frequently cited threat, identified by 46% of respondents in Minjarna Shenkora as the primary cause of medicinal plant decline (Getachew & Belude, 2023). Overharvesting; particularly of roots, and fuelwood collection ranked second and third in Menz Keya Gebreal (Yifru et al., 2025). Ensaro respondents identified agricultural expansion, fuelwood collection, cutting for fencing and furniture, and charcoal production as major threatening factors (Asfaw et al., 2022). In Gishie Rabel, frosty weather was additionally noted as a climatic stressor (Assefa & Woldearegay, 2024).

Existing conservation practices are localized and largely incidental rather than purposive. Sacred groves and home gardens provide de facto protection for some species: 16.5% of medicinal plants in Menz Keya Gebreal were cultivated in home gardens (Yifru et al., 2025), while 24 of 95 species in Gishie Rabel occurred in home-garden settings (Assefa & Woldearegay, 2024). However, the Ensaro ethnoveterinary study concluded that existing conservation efforts undertaken by the local community are insufficient to address the loss of plant species from their natural habitats (Asfaw et al., 2022). No district reported systematic *ex situ* conservation programs or formal sustainable harvesting protocols.

3.6 Discussion

a. A Consistent but Threatened Pharmacopoeia

The convergent dominance of Asteraceae, Fabaceae, and Lamiaceae across North Shewa districts mirrors broader Ethiopian and East African patterns, suggesting deep-time ethnobotanical selection for bioactive taxa within these families (Assefa & Woldearegay, 2024; Yifru et al., 2025). The prominence of *Hagenia abyssinica* (a vermifuge with documented anthelmintic properties), *Ocimum lamiifolium* (widely used for febrile and respiratory conditions), and *Echinops kebericho* (a culturally salient remedy for fibril illness) indicates robust, cross-community validation of efficacy that merits prioritized phytochemical investigation (Asfaw et al., 2022; Assefa & Woldearegay, 2024; Yifru et al., 2025).

The high Informant Consensus Factor (ICF) values for skin and digestive disorders (0.82–0.87) align with the dermatological and gastrointestinal conditions most prevalent in rural Ethiopian settings where hygiene infrastructure and water quality remain limiting (Getachew & Belude, 2023; Yifru et al., 2025). These categories represent low-hanging targets for ethnopharmacological validation and potential integration into primary care.

b. The Leaf Paradox

Leaves being the dominant harvest organ present an apparent conservation paradox. Leaf harvesting is theoretically sustainable; it does not kill the plant and allows regeneration. However, the simultaneous high reliance on roots (second most-used part) and the prevalence of destructive whole-plant extraction for root material offset this advantage (Assefa & Woldearegay, 2024; Yifru et al., 2025). The preference for leaves likely reflects both ease of collection and empirical awareness that many bioactive compounds concentrate in foliage. Conservation interventions must therefore target root-harvesting practices specifically rather than assuming leaf-dominance confers sustainability.

c. Knowledge at the Precipice

Vertical, intra-familial transmission preserves knowledge integrity but creates a fragile system with no redundancy. The death of a single elder can extinguish decades of accumulated empirical observation. The reported reluctance of younger generations to engage with traditional medicine, driven by modernization, formal education, and the stigma sometimes attached to non-biomedical practices—represents an existential threat more immediate than habitat loss for some knowledge domains (Assefa & Woldearegay, 2024; Melese et al., 2026). The absence of any systematic documentation initiative at the zonal or regional level is a critical policy failure.

d. Conservation: Local Practices, Structural Gaps

Sacred groves and home gardens provide meaningful *in situ* protection for a subset of species, but their coverage is inadequate relative to the scale of extraction pressure (Assefa & Woldearegay, 2024; Yifru et al., 2025). The 46% figure for agricultural expansion as a driver of decline in Minjarna Shenkora underscores that medicinal plant conservation cannot be separated from broader land-use policy (Getachew & Belude, 2023). Ethiopia's decentralized governance structure offers both opportunity (local adaptation) and risk (variable capacity and political will). Community-based conservation models that provide tangible economic incentives—such as sustainable harvesting cooperatives for high-value species—remain untested in North Shewa (Asfaw et al., 2022).

e. Limitations

This review is constrained by several factors. First, methodological heterogeneity across studies (varying informant selection, index calculation, and ailment categorization) precludes formal meta-analysis. Second, publication bias likely favors districts with active research institutions (Menz Keya Gebreal, Ensaro) over less accessible areas. Third, the urban seed-remedy study, while valuable, is not comparable in scope to full floristic surveys (Melese et al., 2026). Fourth, ethnobotanical indices such as ICF are sensitive to informant sample size and ailment grouping decisions. Finally, no longitudinal data exist to empirically quantify knowledge erosion rates; the "erosion" narrative, while plausible and widely asserted, remains inferred rather than measured.

f. Research Agenda

Four priorities emerge from this synthesis

First, phytochemical validation of the highest-FL species (*Hagenia abyssinica*, *Ocimum lamiifolium*, *Echinops kebericho*, *Clutia abyssinica*) against their ethnomedicinal indications, with particular attention to hepatitis and dermatological applications (Yifru et al., 2025).

Second, longitudinal knowledge transmission studies that track intra-familial transfer across generations using standardized instruments.

Third, conservation intervention trials comparing community-based sustainable harvesting models against status quo extraction.
Fourth, integration feasibility studies examining how traditional healers might be formally engaged within Ethiopia's Health Extension Program without compromising either biomedical safety standards or traditional practice autonomy.

IV. Conclusion

North Shewa Zone harbors a pharmacologically significant and quantitatively validated medicinal flora, characterized by strong cross-district consensus for remedies treating skin, digestive, and reproductive ailments. High Informant Consensus Factor values and consistent prioritization of taxa such as Hagenia abyssinica, Ocimum lamiifolium, and Echinops kebericho demonstrate robust ethnobotanical validation that warrants targeted phytochemical and pharmacological investigation. The region's ethnobotanical knowledge, transmitted almost exclusively through vertical family lines, faces compounding threats from habitat conversion driven by agricultural expansion, destructive root harvesting, and progressive generational disengagement linked to modernization and formal education.
Current conservation practices, including sacred groves, home gardens, and informal cultural norms—offer localized protection for a subset of species but remain inadequate relative to the scale of extraction pressure and land-use change. The evidence base, while growing through recent district-level surveys, remains geographically uneven and methodologically fragmented, limiting the capacity for formal comparative synthesis or policy-ready recommendations.
Closing the research gaps identified in this review is a prerequisite for evidence-based conservation and for realizing the pharmacological potential embedded in North Shewa's traditional medicine. Priority actions include standardized multi-district floristic surveys, longitudinal studies of knowledge transmission, community-based sustainable harvesting trials, and careful exploration of pathways for integrating validated traditional practices into Ethiopia's primary healthcare system. Without such coordinated efforts, both the biological resources and the biocultural knowledge that sustain them risk irreversible loss.

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