

Ethnobotany of traditional cosmetics among the Oromo Women in Madda Walabu District, Bale Zone, Southeastern Ethiopia

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Abstract

The use of plants as natural cosmetics has been perceived as a source of welfare. However, the plants and the associated indigenous knowledge are continuously depleting globally. The study thus aimed to investigate the ethnobotany of traditional cosmetics among Oromo women in the Madda Walabu District of Bale Zone, Southeastern Oromia, Ethiopia. Ethnobotanical information such as plant species used for traditional cosmetics, method of preparation, and administration were collected among 150 Oromo women using semi-structured questionnaires. Thereafter, quantitative ethnobotanical indices, including the Informant consensus factor (ICF), and the level of fidelity (FI) were computed to determine the most important species used by the women. A total of 48 plant species belonging to 31 families used as sources of traditional cosmetics were recorded among Oromo women in the district. The most frequent family was Fabaceae followed by Bigonaceae, Burseraceae, and Combretaceae. Most of the plants used as traditional cosmetics were trees, followed by shrubs and herbs in life forms. Leaves are the most commonly used plant part in traditional cosmetics followed by barks; and maceration and decoction are the most common preparation methods applied to prepare plant-based traditional cosmetics. Traditional cosmetics are applied to various parts of the body and are mainly administered topically while oral infusions were not common. All categories had high ICF values, ranging from 0.80 to 0.98. The highest ICF value was found for skin treatment, followed by the hair, and Face mask. Overall, *Commiphora habessinica*, *Gnidia stenophylla*, *Kalanchoe lanceolata*, *Mimusops kummel*, *Sesamothamnus rivae*, *Terminalia brownii*, *T. laxiflora*, *Acacia drepanolobium*, *A. mellifera* and *Aloe citrina* were the most frequently cited plants by Oromo women for traditional cosmetic purposes in the study area. However, there will be a need to conduct laboratory-based experiments to establish the efficacy and safety of these documented plants using relevant biological assays.

Introduction

Human beings have been struggling to increase their natural beauty to be more attractive using traditional cosmetics beginning thousands of years back (6000 BC) [1]. In many countries around the world, traditional societies have always used natural substances such as plant extracts for several reasons including skin protection against the sun, and skin beauty, as well as for conveying messages of tribal identity [2].

The demand for beauty products such as soaps, face washes, shampoos, conditioners, skin lotions, toners, astringents, cold creams and other moisturizing formulations, perfumes, hair colors, dyes, powders, eye and face packs, etc. has been growing globally requiring trillion-dollar investment [3]. Cosmetic-pharmaceutical products were intended to improve not only the beauty but also the health of individuals [4].

On the other hand, due to their potential negative health effects in recent years, cosmetic products of synthetic origin have been widely criticized which has increased interest in the use of traditional cosmetics as they are considered less toxic, effective, and believed to contain antioxidants [5]. Most of

these cosmetics were prepared from plants. Traditional cosmetics are natural cosmetics into which no synthetic chemical ingredients are added and made locally by the members of the ethnic group. Even today, traditional cosmetics are in use in many developing countries and Ethiopia is no exception. In preparing traditional cosmetics, different ethnic groups in the world have been using different species of plants. Furthermore, cross-culturally, the use of cosmetics is more common among women than men. This arises from the potential interest of women to attract their male partners and to a rival competition [6]. Moreover, the use of cosmetics makes women appear healthier, more attractive, and more feminine [4].

In any culture, the knowledge and practices of ethnobiology vary by, ethnicity, religion, profession, educational background, social status and relations, income class, age, and gender [7]. Women are likely the most important in the management of plant biodiversity in biodiversity-rich regions including Ethiopia [8, 9].

The indigenous knowledge of the preparation and use of traditional cosmetics has a long history. This knowledge has been transferred from generation to generation orally [10]. With the increasing development of technologies, however, the Knowledge of these traditional cosmetics has been decreasing [5]. In addition, plant diversity from which these cosmetics are believed to be made is also depleting globally due to anthropogenic factors such as the expansion of agriculture in addition to the invisibility of the environmental benefits that are derived from women's biodiversity management [11]. Furthermore, the use of plants as traditional cosmetics has only been poorly investigated in different regions including Ethiopia [12, 13] as more emphasis was given to traditional medicines despite their important role in the economy, improvement of beauty and minimizing health risks of synthetic cosmetics. Thus, the study focused on the investigation of the ethnobotany of traditional cosmetics and associated knowledge used by Oromo women in the Madda Walabu district as cosmetics is more practiced by women who arise from their interest to attract the mates and compete with rivals [6].

Materials and methods

Study area

The study was conducted in Madda Walabu district, Bale Zone, Oromia National Regional State, Southeast Ethiopia located between 9°44'32"and 9°46'26"N and 39° 44'00"and 39° 47'19"E (Fig. 1). It is located at about 630 km from Addis Ababa and 200 km from the zone capital (Robe town) in the Southeast. The topography of the area is steep and dissected by ravines and gorges through which rivers and streams tumble down the southern escarpment. Oromo is the most dominant ethnic group in the area and is the most populous ethnic group in the country [14] accounting for approximately 40% of the currently estimated 110 million total population of the country [15].

Data collection

A total of 150 informants (all of whom are women) were selected purposively to obtain high-quality and reliable information. The selection of informants was based on the recommendations of elders and local authorities. All the respondents were living in rural areas and from a variety of socio-economic strata, with knowledge of traditional cosmetics. Data including the local names of the plant species used for traditional cosmetics, their preparation, and administration methods were collected using semi-structured interviews from June to August 2021. Plant specimens collected during the field walk were identified using the Flora of Ethiopia and Eritrea.

Data analysis

Fidelity level

The level of fidelity (FI) was computed to determine the most important plant species used by women for traditional cosmetics employing the formula used in [16].

$$\%FL = \frac{I_p}{I_u} \times 100$$

Where IP is the number of informants who independently suggested the use of a species for a particular use category;

Iu is the total number of informants who mentioned the plant for any use category.

The more the value of FL is close to 1, the higher the number of informants that used this plant species for that particular use. This index answers the question: “Which use is associated with this particular plant?” Moreover, a one-way analysis of variance (ANOVA) was used to assess the difference in traditional cosmetics among the Oromo women based on their ages, level of education, marital status, and occupation. Free R software was used for all the analyses [17].

Informant consensus factor

The informant consensus factor (ICF) was calculated to assess the variability of plant usages in cosmetics within each of the ten categories using the formula as used in [18]

$$ICF = \frac{N_{ur} - N_t}{N_{ur} - 1}$$

Where, Nur is the number of usages reported for a category

Nt the number of plant species reported to be used in that particular category.

ICF values vary between 0 and 1 and a value close to 1 indicates strong consensus among informants, that is, a large proportion of the informants use the same species for the same purpose. When close to 0, the IFC value indicates a strong disagreement among informants.

Results

Socio-demographic features

Demographic characteristics of the informants

In the study, although the age of the participants ranged from 20–75 years, most of the respondents were above 50 years old. Concerning education, the majorities of the participants were not attended formal education at all and attended primary education. Most of the respondents were married and housewives in occupation (Table 1).

Table 1
Demographic characteristics of the female respondents (i.e. Oromo women) in Madda Walabu District, Bale Zone, Oromia, Ethiopia

Demographic characteristics		Frequency	Proportion (%)
Age	< 30	15	10.00
	30 and 50	52	34.67
	> 50	83	55.33
	Total	150	100.00
Education	No formal education	70	46.67
	Primary	60	40.00
	Secondary	20	13.33
	Total	150	100.00
Marital status	Single	10	6.67
	Married	130	86.67
	Divorced	5	3.33
	Widowed	5	3.33
	Total	150	100.00
Occupation	Student	5	3.33
	Housewife	125	83.33
	Self employed	15	10.00
	Government employed	5	3.33
	Total	150	100.00

Composition of plant species used as a traditional cosmetic in Madda Walabu district

A total of 48 plant species belonging to 39 genera and 31 families were recorded as a source of traditional cosmetics among Oromo women in the Madda Walabu District of Bale Zone. The most common family was Fabaceae represented by six spp. followed by Bigonaceae, Burseraceae, and Combretaceae (Table 2: Appendix 1).

Table 2
List of plant families with their frequency

Family	Freq.	Proportion	Family	Freq.	Proportion
Aloaceae	1	2.08	Meliaceae	1	2.08
Anacardiaceae	1	2.08	Myrtaceae	1	2.08
Bignoniaceae	4	8.33	Olacaceae	1	2.08
Boraginaceae	3	6.25	Oleaceae	1	2.08
Burseraceae	4	8.33	Pedaliaceae	1	2.08
Capparidaceae	1	2.08	Rhamnaceae	1	2.08
Caricaceae	1	2.08	Rutaceae	2	4.17
Combretaceae	4	8.33	Salvadoraceae	1	4.17
Commelinaceae	1	2.08	Santalaceae	1	2.08
Crassulaceae	1	2.08	Sapindaceae	1	2.08
Cupressaceae	1	2.08	Sapotaceae	1	2.08
Euphorbiaceae	3	6.25	Simaroubaceae	1	2.08
Fabaceae	6	12.50	Solanaceae	2	4.17
Lamiaceae	1	2.08	Thymelaeaceae	1	2.08
Lauraceae	1	2.08	Tiliaceae	1	2.04
Loganiaceae	1	2.08			

Traditional cosmetics

Plant parts and growth forms of traditional cosmetics

The most common plant parts used in the preparation of traditional cosmetics were leaves followed by barks, and wood from the stem, whereas plant parts such as seeds, fruits, and resins were rarely used. Trees were found to be the most frequent source of traditional cosmetics in the study area followed by shrubs (in life forms (Fig. 2; Table 3).

Methods of preparation and administration

Maceration and decoction were the most common methods used to prepare plant-based traditional cosmetics (Fig. 3A; Table 3). These methods were usually used by the Oromo women to soften and extract materials that can be used in the production and beautification of the skin, and hair. Furthermore, smoking was also mentioned as a common method, particularly in the use of traditional cosmetics such as perfume. Traditional cosmetics are applied to different parts of the body. Moreover, these natural-based cosmetics are mainly administered topically (88%) while oral infusions were not common (12%) (Table 3). The participant highlighted that plants used for natural-based cosmetics may be administered as a powder (leaves, root, or wood powder) through different mechanisms depending on the need for beautification.

Figure 3. Methods of preparation (A), and major use categories (B) of the plant based traditional cosmetics products among Oromo women in Madda Walabu District of Bale Zone

Table 3

Plant species, parts used (PU), methods of preparation (MP), use category (UC) and application area (AP) for traditional cosmetics by Oromo women in Madda Walabu district, southeast Ethiopia

Species	PU	MP	Administration	UC	AP
<i>Acacia brevispica</i> Harms	Leaves	Decoction	Applied topically via sprinkling on wounds and pimples	Perfume	Skin
<i>A. drepanolobium</i> Harms ex Sjöstedt.	Fruit	Maceration	Oil is applied topically to repair and beautify the skin	Skin care	Skin
<i>A. etbaica</i> Schweinf.	Wood	Directly used	The trunk for brushing teeth	Teeth Hygiene	Teeth
<i>A. mellifera</i> (Vahl) Benth.	Flower	Maceration	The oil applied topically as hair cream	Hair coloring	Hair
<i>Aloe citrina</i> Carter & Brandham	Whole	squeezing	The fluid squeezed is used for skin beauty	Skin care	Skin
<i>Azadirachta indica</i> A. Juss.	leaves	Maceration	Boiling the fresh leaves	Face cleaner	Face
<i>Boswellia neglecta</i> S.Moore	resin	Smoked	Resins are dropped on fire	Perfume	Skin
<i>Cadaba longifolia</i> (R. Br.) DC.	Bark	Smoked	Pieces of barks are burned on fire	Perfume	Skin
<i>Carica papaya</i> L.	Leaves	Decoction	Bark is applied topically on burn wounds (burns).	Skin care	Skin
<i>Citrus aurantifolia</i> (Christm.) Swingle	Bark	Maceration	Bark is applied topically on burn wounds (burns).	Face cleaner	Face
<i>Combretum adenogonium</i> Steud. ex A. Rich.	Leaves	Decoction	The leaves are applied topically on wounds and sores.	Face cleaner	Face
<i>Commiphora baluensis</i> Engl.	Bark	Maceration	Bark is used for wounds and it rejuvenates the skin and is applied topically on the skin or wounds.	Face mask	Face
<i>Commiphora habessinica</i> (Berg) Engl.	Leaves	Maceration	Leaves are applied topically on wounds.	Hair health	Hair
<i>C.myrrha</i> (Nees) Engl.	Bark	Smoked	The bark is burned and vagina is fumigated	Vaginal health	Vagina

Species	PU	MP	Administration	UC	AP
<i>Cordia africana</i> Lam.	Bark	Maceration	Barks are grinded and mixed with water	Hand decorative	Hand
<i>Cordia monoica</i> Roxb.	Leaves	Decoction	The leaves are used to wash the vagina	Vaginal health	Vagina
<i>Croton dichogamus</i> Pax	Bark	Maceration	The oil from the bark applied topically to repair and beautify the skin	Face mask	Face
<i>Croton macrostachyus</i> Del.	Seeds	Maceration	Stimulate hair growth; it is applied topically	Hair cream	Hair
<i>Dalbergia commiphoroides</i> Bak. f.	Leaves	Decoction	The bark is grinded and used	Skin care	Skin
<i>Delonix elata</i> (L.) Gamble	Leaves	Decoction	Leaf is crushed and rubbed on the skin	Skin care	Skin
<i>Dobera glabra</i> (Forssk.) Poir.	Roots	Maceration	Roots are applied topically and orally for mouth sores and as toothpaste	Teeth Hygiene	Teeth
<i>Dodonaea angustifolia</i> L. f.	Wood	Directly used	The trunk for brushing	Teeth Hygiene	Teeth
<i>Ehretia cymosa</i> Thonn.	leaves	Maceration	Leaves are applied topically on wounds	Hand decorative	Hand
<i>Euphorbia tirucalli</i> L.	Leaves	Directly used	Applied orally and as lotion on burn skin and wounds	Perfume	Skin
<i>Gnidia stenophylla</i> Gilg	Leaves	Maceration	The leaves are burned and applied topically on the wound.	Skin care	Skin
<i>Grewia bicolor</i> Juss.	Bark	Maceration	Grinded and mixed with water	Face mask	Face
<i>Juniperus procera</i> Hochst. ex Endl	Wood	Smoked	By frightening the trunk	Perfume	Skin
<i>Kalanchoe lanceolata</i> Forssk.) Pers.	Whole plant	Decoction	Grinding of root and bark	Skin care	Skin
<i>Kirkia burgeri</i> Stannard	Roots	Maceration	The oil from the root applied topically as hair cream	Skin care	Skin

Species	PU	MP	Administration	UC	AP
<i>Mimusops kummel</i> A. DC.	Leaves	Decoction	The sap squeezed directly on skin wounds	Skin care	Skin
<i>Murdannia simplex</i> (Vahl) Brenan	Roots	Smoked	It is taken orally as a mouthwash.	Teeth Hygiene	Teeth
<i>Olea europaea</i> L. subsp. <i>cuspidata</i> (Wall. ex G.Don)	Seeds	Maceration	Stimulate hair growth and applied topically.	Hair cream	Hair
<i>Osyris quadripartita</i> Decn.	Bark	Maceration	Bark is taken orally because it is believed the skin is affected from the inside.	Hair health	Hair
<i>Persea americana</i> Mill.	Leaves	Directly used	Leaves are applied topically on wounds	Face mask	Face
<i>Premna schimperi</i> Engl.	Leaves	Decoction	Put the medicine on the infected teeth	Teeth Hygiene	Teeth
<i>Rhamnus staddo</i> A. Rich.	leaves	Decoction	crushed the leaves and applied them	Perfume	Skin
<i>Rhus natalensis</i> Krauss	Wood	Directly used	A piece of trunk is cut and used	Teeth Hygiene	Teeth
<i>Sesamothamnus riva</i> Engl.	Bark	smoked	Powder from the bark applied as paste on the mouth sores.	Skin care	Skin
<i>Solanum hastifolium</i> Hochst. ex Dunal in DC.	Roots	Decoction	The cream is applied on skin (acne)	Skin care	Skin
<i>Solanum lycopersicum</i> L.	Fruit	Squeezed	Fruit sap are administered topically as a facial wash	Face cleaner	Face
<i>Stereospermum kunthianum</i> Cham.	Bark	Directly used	A piece of bark is cut and used	Teeth Hygiene	Teeth
<i>Strychnos mitis</i> S. Moore	Wood	Smoked	A piece of wood is burned on small fire	Skin care	Skin
<i>Syzygium guineense</i> (Willd.) DC	Bark	Smoked	A piece of bark is burned on small fire	Perfume	Skin
<i>Terminalia brownii</i> Fresen.	Seeds	Maceration	Mixed with soil for cleaning teeth & orally as toothpaste	Teeth Hygiene	Teeth
<i>Terminalia laxiflora</i> Engl. & Diels.	Bark	Maceration	It is applied topically on wounds.	Skin care	Skin

Species	PU	MP	Administration	UC	AP
<i>Withania somnifera</i> L. Dunal in DC.	Wood	Decoction	Leaves crushed and extracts applied on skin	Perfume	Skin
<i>Ximenia americana</i> L.	Wood	Directly used	The trunk for brushing teeth	Teeth Hygiene	Teeth
<i>Zanthoxylum chalybeum</i> Engl.	Bark	Squeezed	squeezed cock and applied the fluid	Hair coloring	Hair

Main cosmetic plants of the study area

Eight plant species were cited by one-third of the informants as main cosmetic plants (Table 4).

Terminalia brownii Fresen. was the most cited traditional cosmetic plant used as hair cream followed by *Aloe citrine*, used for skin care, and *Olea europaea* L. subsp. *cuspidata* (Wall. ex G.Don) (Table 4).

However, when taking each category of usage into account, the most cited plants were different. For example, *Terminalia laxiflora* Engl. & Diels. were the most cited in the skincare category, *Rhus natalensis* Krauss in the keeping teeth hygiene, *Combretum adenogonium* Steud. ex A. Rich. in the face clearance, *Cordia monoica* Roxb. in the vaginal health, and *Ehretia cymosa* Thonn. in the category of hand decorative (Table 4; Appendix 2).

Table 4

The main cosmetic plants cited by most of the informants in the study area (GF = Growth Form; No.C = Number of citations and No.C(%) = Percentages of number of citations)

Species	GF	Local name	Application area	No. C	No.C (%)
<i>Terminalia brownii</i> Fresen.	T	birdheessa	Hair	47	3.77
<i>Aloe citrina</i> Carter & Brandham	H	hargiisa	Skin	45	3.61
<i>Olea europaea</i> L. subsp. <i>cuspidata</i> (Wall. ex G.Don)	T	ejersa	Hair	45	3.61
<i>Sesamothamnus riva</i> Engl.	T	dareessa	Skin	45	3.61
<i>Terminalia laxiflora</i> Engl. & Diels.	S	dabaqqaa	Skin	45	3.61
<i>Syzygium guineense</i> (Willd.) DC.	T	baddeessa	Skin	43	3.45
<i>Rhus natalensis</i> Krauss	T	daboobessa	Teeth	42	3.37
<i>Combretum adenogonium</i> Steud. ex A. Rich.	T		Face	41	3.29
Sum					28.35

Fidelity level of a species for a particular use

In the study, greater cosmetic usage citations were exhibited in the fidelity level (FL) revealing the importance of a species for a particular use. Nineteen fidelity level values higher than 88% related to use-

species associations known by more than half of the informants (Table 5; Appendix 1). Thus 19 species and nine cosmetic uses appeared to be particularly linked. Fidelity levels were high (> 80% of FL) for several species (Appendix 2). The highest FL score was recorded for *Terminalia brownii* Fresen. used for the beautification of hair followed by *Terminalia laxiflora* Engl. & Diels. for skin care, *Sesamothamnus riva* Engl. for skin care, *Olea europaea* L. subsp. *cuspidata* (Wall. ex G.Don) for hair cream and *Aloe citrina* Carter & Brandham for skin care (Table 5; Appendix 2).

Table 5

Plants with high fidelity level values (> 88%) against cosmetic use category of Oromo women in Madda Walabu district, southeast Ethiopia (FL = Fidelity Level, Ip = number of informants who independently cited the importance of a species for treating a particular use category, lu = total number of informants who reported the plant for any given use category)

No	Scientific name	Use category	Ip	lu	FL (%)
1	<i>Terminalia brownii</i> Fresen.	Hair cream	23	24	95.83
2	<i>Terminalia laxiflora</i> Engl. & Diels	Skin care	22	23	95.65
3	<i>Sesamothamnus riva</i> Engl.	Skin care	22	23	95.65
4	<i>Olea europaea</i> L. subsp. <i>cuspidata</i> (Wall. ex G.Don)	Hair cream	22	23	95.65
5	<i>Aloe citrina</i> Carter & Brandham	Skin care	22	23	95.65
6	<i>Syzygium guineense</i> (Willd.) DC.	Perfume	21	22	95.45
7	<i>Combretum adenogonium</i> Steud. ex A. Rich.	Face cleaner	20	21	95.24
8	<i>Euphorbia tirucalli</i> L.	Perfume	19	20	95.00
9	<i>Commiphora habessinica</i> (Nees) Engl.	Hair health	16	17	94.12
10	<i>Premna schimperi</i> Engl.	Teeth	16	17	94.12
11	<i>Murdannia simplex</i> (Vahl) Brenan	Teeth Hygiene	15	16	93.75
12	<i>Gnidia stenophylla</i> Gilg	Skin care	15	16	93.75
13	<i>Commiphora baluensis</i> Engl.	Face mask	13	14	92.86
14	<i>Rhus natalensis</i> Krauss	Teeth Hygiene	20	22	90.91
15	<i>Cordia africana</i> Lam.	Hand decorative	8	9	88.89
16	<i>Stereospermum kunthianum</i> Cham.	Teeth Hygiene	16	18	88.89
17	<i>Azadirachta indica</i> A. Juss.	Face cleaner	8	9	88.89
18	<i>Cordia monoica</i> Roxb.	Vaginal health	15	17	88.24

Cosmetic use category and application areas

Most of the categories (i.e. three fourth) had high mean Fidelity levels for particular use values, ranging from 72.73% to 92, 03% (Fig. 4A). The highest mean FL value was recorded to use as hair cream, followed by hair health and hand decorative; and skin and face mask were the 4th and 5th respectively (Table 5). The traditional cosmetics among the Oromo women in Madda Walabu District were used for care and beautifying skin followed by teeth hygiene and face cleaning and masks (Fig. 4B).

Informant consensus factor (ICF)

To compute the informant consensus factor values, cosmetic use categories of the study area were grouped into 10 categories (Table 6; Fig. 4A). All categories had high informant consensus factor values, ranging from 0.92 to 0.96. Specifically, face clearance and mask scored the highest ICF value, followed by hair treatment (Table 6). The traditional cosmetics among the Oromo women in Madda Walabu District were thus used to care for and beautify the face, followed by hair and skin (Table 6).

Table 6
Cosmetic use category and informant consensus factor of Oromo women in Madda Walabu district, southeast Ethiopia

Use category	Number of use reports in each category (Nur)	Number of taxa (Nt)	Informants' consensus factor (IFC)
Face cleaner	56	3	0.96
Face mask	26	2	0.96
Hair coloring	25	2	0.96
Hair cream	23	2	0.95
Hair health	109	8	0.94
Hand decorative	16	2	0.93
Perfume	171	13	0.93
Skin care	43	4	0.93
Teeth Hygiene	38	4	0.92
Vaginal health	86	8	0.92

Socio-demographic factors in the use of traditional cosmetics among Oromo women

There were highly significant differences in the number of plant species used as traditional cosmetics among the Oromo women with different ages ($F=, 70.6$ $p < 0.001$), level of education, ($F=, 154.0$ $p <$

0.001), marital status ($F = 68.4$ $p < 0.001$), and occupation ($F = 45.4$ $p < 0.001$). Older women mentioned more plant species used as traditional cosmetics than younger ones. Women who did not attend formal education were found to be retaining indigenous plant use knowledge more than educated ones. Moreover, married and housewives were found to be with extensive traditional knowledge compared to other married status-employed women in the study area (Fig. 5).

Traditional knowledge and cultural practices

The respondents made clear that traditional knowledge about natural-based cosmetics is widely spread among the Oromo women in the Madda Walabu district although they do not regularly exchange knowledge with other communities around. The Oromo women played a primary role in the preparation and administration of natural-based cosmetics. Their homemade remedies were prepared for the whole community who require different forms of preparations such as poultices or compresses. Some plant species that are used for natural-based cosmetics among the Oromo women are also used as an aspect of healing. Hence, the Oromo women who were knowledgeably articulated that natural-based cosmetics are an interdisciplinary practice that heals and promotes the beauty of the skin. Respondents mentioned that plant species are collected throughout the year, and seasonality only plays a role when plant parts such as fruits or leaves are to be collected. It was observed that the Oromo women who were knowledgeable about natural-based cosmetics harvested and carried as many plants as they could when they go out for collection. The decision to have the large collection at once is due to the long distance they had to travel for the collection and the increasing scarcity of certain plant species. Moreover, the respondents mentioned that large collections of scarce species are recently threatening the species. Despite the presence of gender divisions for different activities because of cultural restrictions, the majority of women respondents mentioned that there were no taboos associated with nature-based cosmetic plant collection and uses in the study area.

Description of particular care types among Oromo Women

Intimate hygiene is typical of the Oromo women in Oromia which is called **qayyachuu** in Afaan Oromo. Care of private parts through fumigation is very important for women, particularly for married women. These treatments are preventive actions to avoid bad smells, limit vaginal discharges, and can arouse the woman; making her ready for sexual activities. For the fumigation process, a small hole is made inside the home where wood material is placed on a fire and women cover their bodies with a cloth below their necks. The wood materials for **qayyachuu** are mainly prepared from the mix of the barks and branches from plant species such as *Commiphora baluensis* Engl., *C. habessinica* (Berg) Engl. and *C. myrrha* (Nees) Engl. These intimate care treatments are only for the female gender.

Discussions

Composition of plants used in traditional cosmetics in Madda Walabu district

Despite the present study described and documented plants used as traditional cosmetics, sometimes it is very difficult to draw a clear line between the plants used as cosmetics and medicines and vice versa [19, 20, 21]. The result of this study revealed the medicinal role of the plant species in addition to their cosmetic use. For instance, the plant parts of *Acacia brevispica* Harms., *Citrus aurantifolia* (Christm.) Swingle, *Carica papaya* L., *Commiphora baluensis* Engl. *C. habessinica* (Berg) Engl., *Dobera glabra* (Forssk.) Poir., *Dodonaea angustifolia* L. f, *Ehretia cymosa* Thonn., *Euphorbia tirucalli* L., *Gnidia stenophylla* Gilg., *Mimusops kummel* A. DC. is applied topically to heal wounds on the skin, and as anti-acne, and heal mouth sores (Appendix 2). Therefore, we recommend amplified research in the future and assessing multipurpose ethnobotanical use values since our study is an eye opener for the study area and aimed to mainly investigate cosmetical aspects.

In various parts of the world including Ethiopia, many plant species are commonly used locally for the preparations of traditional cosmetics but have not been scientifically investigated for wider use [22]. This implies a need to collect and compile indigenous knowledge of plant-based traditional cosmetics among tribes, specifically, the Oromo (largest ethnic group in Ethiopia) women of Bale lowland in this study. Accordingly, a total of 48 plant species used as traditional cosmetics were recorded of which Fabaceae, Bigonaceae, and Burseraceae were the most frequent families. The study thus revealed that there is a great diversity of plants for cosmetic use, which could be useful documentation, contributing to preserving the knowledge about the traditional cosmetic use of plants in this region. Consequently, the ethnobotanical study of these species reveals that traditional cosmetics are still very attached to the habits of the local population, especially among the elderly, Oromo women.

The study documented a relatively higher number of species specifically used as traditional cosmetics compared to other similar studies (Table 7). This high number of species could be attributed to the varied agroecology and climatic conditions of our study area that supported a variety of plant species. The comparison of the species number discovered in different countries is presented.

Table 7
Number of plant species used as a traditional cosmetic reported in different countries

Number of species	Country	References
27	Alexandria, Egypt	[30]
13	Arab-Choa and Kotoko Ethnic Groups in the Semi-Arid Areas of Far North Cameroon	[31]
47	Vhavenda women in Vhembe District Municipality, Limpopo, South Africa	[23]
40	Province of Taza, Northern Morocco	[21]
25	Tropical island of Mauritius	[42]
16	Xhosa women in the Eastern Cape, South Africa	[43]
29	Tribal women of Kashmir Himalayas.	[2]

Moreover, the top rank of Fabaceae which aligns with [23], as a source of local cosmetics is not surprising for several reasons. First, Fabaceae is among the most species-rich families (3rd) in the flora area of the country [24, 25]. The same is true for the Burseraceae family since the vegetation of the study area is mainly *Acacia-Commiphora* woodlands [26]. The potential importance of the species as cosmetics in this family could therefore be a result of its representation in flora of the area. local flora. Second, in neighboring districts with similar agroecology such as Dallo Manna [27] and Gura Damole districts [28], Fabaceae was found to contain many medicinal plants. However, the strange thing was that Lamiaceae which contains many cosmetic and medicinal plants that are of global importance [29, 30], was only represented by one species in the study area. The variation could be attributed to the differences in agroecology. Moreover, similar to other studies in Africa (tropical) that focused on traditional cosmetics [30, 31, 23]. Trees were the most commonly used plant life forms followed by shrubs and herbs. The high usage of such plant life form in Madda Walabu is also likely associated with the tropical climate region which, in turn, helps the plants to be widely available and abundant in the study area

Plant Parts used and use category

Among a range of plant organs used in the study area, leaves are the parts that are most commonly used in traditional cosmetics which are in line with other studies [27, 30, 23, 28]. The preference for leaves as a major source of cosmetics could be asserted by the fact that they are not only easy to collect, store, and process during most of the year but also are the site of photosynthesis and sometimes the storage of bioactive ingredients responsible for the cosmetic properties of the plant helping beautification [32, 33]. The use of leaves as traditional cosmetics encourages conservation practices, unlike the extensive use of roots and barks which may cause the death of plants. However, reports from some other studies revealed that fruits were the most commonly used plant parts as cosmetics among women [2, 34]. The

difference could be attributed to the variations in indigenous knowledge on plant-based cosmetics differing across different communities and ethnic groups globally.

A greater number of citations for cosmetic applications is exhibited in the fidelity level. In the current study, about 19 species were found to have FL values of greater than 88% suggesting that the state of knowledge of the informants is more or less common when it comes to the uses of such plants. The highest FL scores were recorded on the use of *Terminalia brownii* Fresen. (95.83%) and *Olea europaea* L. subsp. *cuspidata* (Wall. ex G.Don) (95.65%) for hair treatment and *Terminalia laxiflora* Engl. & Diels. (95.65%) and *Sesamothamnus riva* Engl. (95.65%) for skin care of Oromo women. FL is a measure of the degree of effectiveness of the cosmetic plant for beautification. Thus, traditional cosmetic plants having high fidelity level values are speculated to be effective in their beautification potential and can be a good candidate for future further detailed investigation. Although [13] reported the FL values of some of the aforementioned species for their medicinal aspect, no literature has documented their FL scores for cosmetic uses as the present study is the first of its kind in the area and also due to variations of the use of plants from area to area.

From Informant consensus factor analysis, high FIC values suggested that Oromo women in the community share knowledge about the most significant plant species of traditional cosmetics commonly used for beautification and low FIC values indicate less willingness to share knowledge of significant plant species of traditional cosmetics for beautification for women [35]. From the current study, although all the usage categories had higher values, face care has the highest FIC which further substantiates the heavy reliance of Oromo women of Madda Walabu district on plant-based traditional cosmetics.

Method of preparations and mode of application

As documented in other ethnobotanical studies in Bale [36], diverse methods of preparation were observed in the current study. Accordingly, maceration and decoction were the most frequently used preparation methods among the participants. This goes in line with other similar studies where decocting or concocting was mostly the more common way of preparation [33]. Furthermore, in the current study, most of the products of traditional cosmetics were administered topically which aligns with other several studies [37, 38]. This route of administration was demonstrated with eleven different cosmetic applications. Remarkably, this proves the certainty that plant species are intensely entrenched in the cosmetic globe with different kinds of cosmetic uses. Applications of natural-based cosmetics such as a paste, powder, or sap (topically) were also in alignment with the findings [19].

Plant-based Traditional cosmetics and Oromo women's Indigenous knowledge

The current study revealed significant variations in the number of plant species used as traditional cosmetics among Oromo women of different ages. Accordingly, older women mentioned and used more plant species as traditional cosmetics for beautification than younger ones. This aligns with the findings of [2] and [30] indicating that indigenous knowledge of plant-based traditional cosmetics is not equally

distributed among the different age groups of women. Thus, the study revealed a well-established indigenous knowledge of plant-based cosmetics among the Oromo women but seems to decline with age which could be attributed to the low interest of the younger generation to inherit and use traditional cosmetics. The other finding of the current study is that Oromo women, who didn't attend formal education, are married, and housewives have more extensive knowledge of traditional cosmetics than students, educated and employed. This could be due to the inspiration of the younger women, educated and employed ones by intensive media campaigns and advertisements of synthetic cosmetics that might have resulted in decreasing interest in using natural cosmetics [2]. Thus, due to the declining trends of the use of plant-based traditional cosmetics in the younger generation, which was also supported by other studies [39], there is an urgent need for preserving indigenous knowledge of the Oromo women of Madda Walabu district. We suggest that the younger generation should be trained and made aware of the importance, of sustainable utilization as well as the domestication of precious plant-based traditional cosmetics.

The type of occupation also plays a major role in the use of herbal cosmetics. We discovered that housewives use more cosmetic plants for their skin, face, hair, and teeth hygiene than women who work outside of the home. Housewives tend to have less income than working women, hence their higher interest in cheaper cosmetics. Similar studies in Egypt reported that herbal remedies are much more common among lower-income groups, such as students, housewives, and non-literate women [30]. On the contrary, the results of the study that took place in Finland revealed that women who had relatively high social status were the most interested in herbal remedies and cosmetics [40], suggesting that knowledge and use of herbal remedies may be context-specific. On the other hand, [41] reported that knowledge of medicinal plants was not related to age or gender in Brazil.

Besides the regular application of plant-based natural cosmetics, Oromo women knowledgeable about traditional cosmetics indicated that the different types of plant species are inspired mainly by their culture, and cosmetic products are mainly used in cultural practices such as traditional healing and skin-related issues. In contrast to other studies [35], that restrict outdoor activities including plant gathering from wild to men, our study revealed that nature-based cosmetic plant collection was carried out by women which aligns with [23].

Concerning traditional knowledge and cultural practices, the Oromo women made clear that their homemade cosmetics were prepared for the whole community and required different forms of preparation. Moreover, the knowledgeable respondents articulated that natural-based cosmetics are interdisciplinary practices that heal and promote the beauty of skin which is in line with [13].

Furthermore, the current study revealed that there was particular care for intimate hygiene which is typical of the Oromo women in the area that is called **qayyachuu** in Afan Oromo. It is the means of caring for private parts (vagina) through smoking and fumigation, particularly for married women which align with [13] but with a different name, **woyeba chis** meaning smoking bath in northern Ethiopia. The treatments are used to avoid bad smells, limit vaginal discharges, and can arouse the woman; making her ready for

sexual activities. The wood materials for **qayyachuu** are mainly prepared from the mix of the barks and branches from the plant species such as *Commiphora baluensis* Engl., *C.habessinica* (Berg) Engl., and *C. myrrha* (Nees) Engl.

Conclusions

The study described the cosmetic flora of the Madda Walabu district of Bale Zone with its uses. The ethnobotanical study focusing on traditional cosmetics is the first of its kind to be conducted among Oromo women in Ethiopia. A total of 48 plants belonging to 31 families used in traditional cosmetics were investigated, and eight plant species were cited by one-third of the informants as the main cosmetic plants. The traditional cosmetics among the Oromo women in Madda Walabu District were thus used to care for and beautify the face, followed by hair and skin. The most frequent part of the plant used for the preparation of traditional cosmetics was the leaves followed by barks, and wood from the stem. The preparation for the cosmetics was through maceration and decoction which were used to soften and extract the production used as traditional cosmetics. Furthermore, smoking was also mentioned as a common method, particularly in the use of traditional cosmetics such as perfume.

Findings from this study indicated the rich plant biodiversity in terms of the high number of plants used for traditional cosmetics among the Oromo women. Furthermore, women's information regarding the plant used as a traditional cosmetic was highly credible. However, nowadays, knowledge transfer is partly broken, with most young Oromo women. The younger generation seemed to be involved in synthetic cosmetics inspired by intensive media campaigns and advertisements. Thus, there is an urgent need for preserving traditional knowledge and suggests that the young generation should be trained and made aware of the importance, of sustainable utilization as well as the domestication of the precious plants used as traditional cosmetics. Moreover, ethnobotanical studies with a particular reference to traditional cosmetics should be amplified to compare data from different regions of Ethiopia and to document this important cultural wealth, both for its preservation and promotion.

Declarations

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Authors contributions

SS, HT developed the idea of the project; SS designed the study and conducted field data collection; HT, LK conducted data analysis; SS, HT, LK wrote the manuscript. All authors have read and agreed to submit the final version of this manuscript.

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Data availability

Data available on request from the authors.

Conflict of Interest

Authors have no conflict of interest.

References

1. Gebelein CG. Chemistry and our world. Wm.C. Brown Publishers, Dubuque; 1997.
2. Shaheen H, Nazir J, Firdous SS, Khalid AUR. Cosmetic ethnobotany practiced by tribal women of Kashmir Himalayas. *A J P*. 2014; 4:239–250. PMC4110779
3. Allied Market Research. 2015. Global cosmetics market (category, mode of sale, gender and geography) size. Share, Trends, Company Profiles, Demand, Analysis, Growth, Opportunities, and Forecast 2014–2020, 132
4. Gediya SK, Mistry RB, Patel UK, Blessy M, Jain HN. 2011. Herbal plants: used as cosmetics. *J. Nat. Prod. Plant Resour.* 2011; 1: 24–32. <http://scholarsresearchlibrary.com/archive.html>
5. UNEP. Green Economy Sectorial I Study: BioTrade – A Catalyst for Transitioning to a Green Economy in Namibia 2012; 35–64. <https://wedocs.unep.org/20.500.11822/25957>
6. Mafra AL, Varella MAC, Defelipe RP, Anchieta NM, de Almeida CAG, Valentova JV. Makeup usage in women as a tactic to attract mates and compete with rivals. *Pers. Individ. Differ* 2020; 163:110–042. <https://doi.org/10.1016/j.paid.2020.110042>
7. Pfeiffer JM, Butz RJ. Assessing cultural and ecological variation in ethnobiological research: the importance of gender. *J. Ethnobiol.* 2015; 25: 240–278. https://doi.org/10.2993/0278-0771_2005_25_240_acaeви_2.0.co_2
8. Abebe T, Mulu D. The role of women in the management and utilization of home garden: the case of Dale district, in Southern Ethiopia. *Plant Sci. Res.* 2017; 7:41–54.
9. Aseffa W, Kawessa G, Datiko D. Agrobiodiversity and gender: the role of women in farm diversification among smallholder farmers in Sinana district, Southeastern Ethiopia. *Biodivers. and Conserv.* 2022; 31: 2329–2348. DOI:10.1007/s10531-021-02343-z
10. Newman DJ, Cragg GM. Natural products as sources of new drugs over the 30 years from 1981 to 2010. *J. Nat. Prod.* 2012; 75:311–335. <https://doi.org/10.1021/np200906s>
11. Howard P L., ed. 2003. Women and Plants: Gender Relations in Biodiversity Management and Conservation. Zed Books, London
12. Bilal A, Tilahun Z, Shimels T, Gelan, YB, Osman ED. Cosmetics utilization practice in Jigjiga town, eastern Ethiopia: a community based cross-sectional study. *Cosmetics* 2016; 3:1–10. <https://doi.org/10.3390/cosmetics3040040>

13. Abdurhman N. Plant diversity, ethnobotany, and barcoding of medicinal and cosmetic plants in Kalu and Bati districts of Amhara region, Ethiopia. [Doctoral dissertation], [Addis Ababa University]. Addis Ababa; 2020.
14. Boku DD. Oromo wisdom in black civilization. Finfinnee: Finfinnee Printing and Publishing S.C.; 2011.
15. Dibaba AT. Oromo orature: An ecopoetic approach, theory and practice (Oromia/Ethiopia, Northeast Africa). *Humanities* 2020; 9: 28. <https://doi.org/10.3390/h9020028>
16. Hoffman B, Gallahe T. Important Indices in Ethnobotany. *Ethnobot. Res. Appl.* 2007; 5:201–218.
17. R Core Team. R: a language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0. <http://www.R-project.org/> (accessed 30 Oct 2022)
18. Heinrich MA, Ankli B, Frei C, Weimann C, Sticher O. Medicinal plants in Mexico: Healer's consensus and cultural importance. *Soc. Sci. Med.* 1998; 47:1859–1871. DOI:10.1016/S0277-9536(98)00181-6
19. Saikia AP, Ryakala VK, Sharma P, Goswami P, Bora U. Ethnobotany of medicinal plants used by Asamese people for various skin ailments and cosmetics. *J. Ethnopharmacol.* 2006; 06: 149–157. DOI: 10.1016/j.jep.2005.11.033
20. Abbasi AM, Khan MA, Ahmad M, Zafar M, Jahan S, Sultana S. Ethnopharmacological application of medicinal plants to cure skin diseases and in folk cosmetics among the tribal communities of North-West Frontier Province, Pakistan. *J. Ethnopharmacol.* 2010; 128:322–35. <https://doi.org/10.1016/j.jep.2010.01.052>
21. Khabbach A, Libiad M, Ennabili A, Bousta D. Medicinal and cosmetic use of plants from the province of Taza, Northern Morocco. *Bol. Latinoam. Caribe Plantas Med. Aromat.* 2012; 11: 46–60.
22. Kohli K, Ahmed N, Baboota S. Herbs in cosmetics. *Hamdard Med.* 2004; 16:76–79.
23. Ndhlovu PT, Mooki O, Mbeng WO, Aremu AO. Plant species used for cosmetic and cosmeceutical purposes by the Vhavenda women in Vhembe District Municipality, Limpopo, S. Afr J. Bot. 2019; 122: 422–431. <https://doi.org/10.1016/j.sajb.2019.03.036>
24. Didita M, Nemomissa S, Gole TM. Floristic and structural analysis of the woodland vegetation around Dello Menna, southeast Ethiopia. *J. For. Res.* 2010; 21: 395–408. DOI:10.1007/s11676-010-0089-9
25. Asfaw MM, Abebe FB. Traditional medicinal plant species belonging to Fabaceae family in Ethiopia: A systematic review. *Int. J. Plant Biol.* 2021;12:8473. <https://doi.org/10.4081/pb.2021.8473>
26. Friis I, Demissew S, van Breugel P. 2010. The atlas of potential vegetation of Ethiopia. Royal Academy of Science and Letters, Copenhagen
27. Leulekal E, Kelbessa E, Bekele T, Yineger H. An ethnobotanical study of medicinal plants in Mana Angetu District, southeastern Ethiopia. *J. Ethnobiol. Ethnomed.* 2008; 4:10–16. doi:10.1186/1746-4269-4-10
28. Assefa B, Megersa M, Tolossa T. Ethnobotanical study of medicinal plants used to treat human diseases in Gura Damole District, Bale Zone, and Southeast Ethiopia. *Asian J Ethnobiol.* 2021; 4: 42–51. <https://doi.org/10.13057/asianjethnobiol/y040105>

29. Peter KV. 2012. Introduction to herbs and spices: Definition, trade and applications. In: Peter KV. (ed). Handbook of herbs and spices. Woodhead publishing, Cambridge, UK. pp. 55–70.
30. Elansary HO, Mahmoud EA, Shokralla S, Yessoufou K. Diversity of plants, traditional knowledge, and practices in local cosmetics: a case study from Alexandria, Egypt. *Econ. Bot.* 2015; 69: 114–126. DOI:10.1007/s12231-015-9308-9
31. Fedoung EF, Zra T, Biyegue CFN, Bissoue AN, Bauye S, Tsabeng N. Herbal cosmetics knowledge of Arab-Choa and Kotoko ethnic groups in the semi-arid areas of Far North Cameroon: ethnobotanical assessment and phytochemical review. *Cosmetics* 2018; 5:1–12. <https://doi.org/10.3390/cosmetics5020031>
32. Gazzaneo LRS, Lucena RFP, Albuquerque UP. Knowledge and use of medicinal plants by local specialists in a region of Atlantic Forest in the state of Pernambuco (Northeastern Brazil). *J. Ethnobiol. Ethnomed.* 2005;1: 9–12. DOI:10.1186/1746-4269-1-9
33. Afolayan AJ, Grierson DS, Mbeng WO. Ethnobotanical survey of medicinal plants used in the management of skin disorders among the Xhosa communities of the Amathole District, Eastern Cape, South Africa. *J. Pharmacol.* 2014; 153:220–232. <https://doi.org/10.1016/j.jep.2014.02.023>
34. Fongnzossie EF, Tize Z, Fogang Nde PJ, Nyangono Biyegue CF, Bouelet Ntsama IS, Dibong SD, Nkongmeneck BA. Ethnobotany and pharmacognostic perspective of plant species used as traditional cosmetics and cosmeceuticals among the Gbaya ethnic group in Eastern Cameroon. *S. Afr J Bot* 2017; 112: 29–39. DOI:10.1016/j.sajb.2017.05.013
35. Asfaw A, Lulekal E, Bekele T, Debella A E, Debebe E, Sisay B. Medicinal plants used to treat livestock ailments in Ensaro District, North Shewa Zone, Amhara Regional State, Ethiopia. *BMC Vet. Res.* 2022; 18:235. <https://doi.org/10.1186/s12917-022-03320-6>
36. Luizza MW, Young H, Kuroiwa C, Evangelista P, Worede A, Bussmann RW, Weimer A. Local knowledge of plants and their uses among women in the Bale Mountains, Ethiopia. *Ethnobot. Res. Appl.* 2013; 11:315–339. <file:///C:/Users/lkums/Downloads/885-Article%20Text-4814-1-10-20140108.pdf>
37. Khongsai M, Saikia SP, Kayang H. Ethnomedicinal plants used by different tribes of Arunachal Pradesh. *I. J. T. K.* 2011; 10: 541–546. <https://nopr.niscpr.res.in/bitstream/123456789/12036/1/IJTK%2010%283%29%20541-546.pdf>
38. Kaur A, Singh TG, Dhiman S, Arora S, Babbar R. Novel herbs used in cosmetics for skin and hair care: A review. *Plant Arch.* 2020; 20: 3784–3793. https://www.plantarchives.org/SPECIAL%20ISSUE%2020-1/234__3784-3793_.pdf
39. Jan G, Khan MA, Gul F. Ethnomedicinal plants use against jaundice in Dir Kohistan Valleys (NWFP), Pakistan. *Ethnobot. Leafl.* 2009; 13: 1029–41.
40. Hemminki E, Mantyranta T, Malin M, Koponen P. A survey on the use of alternative drugs during pregnancy. *Scand. J. Soc. Med.* 1991; 19:199–204. DOI: 10.1177/140349489101900310
41. Alencar N L, Junior WSF, Albuquerque UP. Medicinal plant knowledge richness and sharing in Northeastern Brazil. *Econ. Bot.* 2014; 68:371–382. DOI:10.1007/s12231-014-9284-5

42. Mahomoodally FM, Ramjuttun P. A quantitative ethnobotanical survey of phytocosmetics used in the tropical island of Mauritius. *J. Ethnopharmacol.* 2016; 193: 45–59.
<https://doi.org/10.1016/j.jep.2016.07.039>
43. Mwinga JL, Makhaga NS, Aremu AO, Otang-Mbeng W. Botanicals used for cosmetic purposes by Xhosa women in the Eastern Cape, South Africa. *S Afr J Bot.* 126: 4–10.
<https://doi.org/10.1016/j.sajb.2019.03.038>

Figures

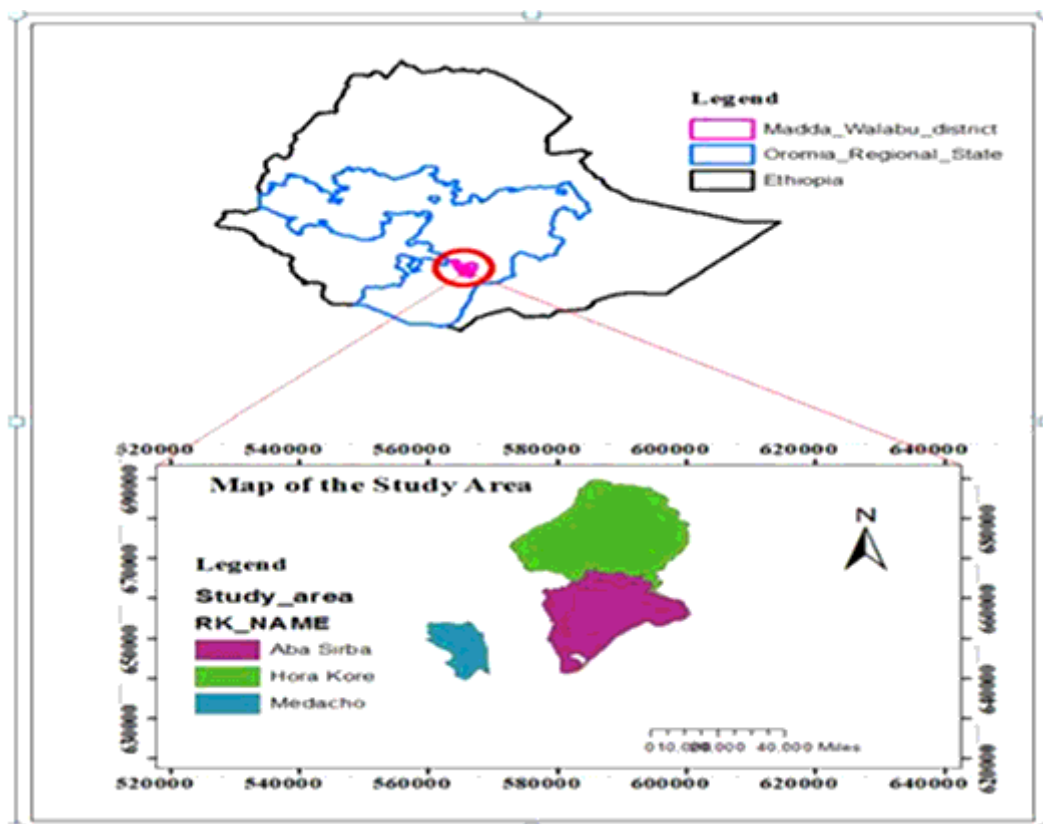


Figure 1

Map of the study area

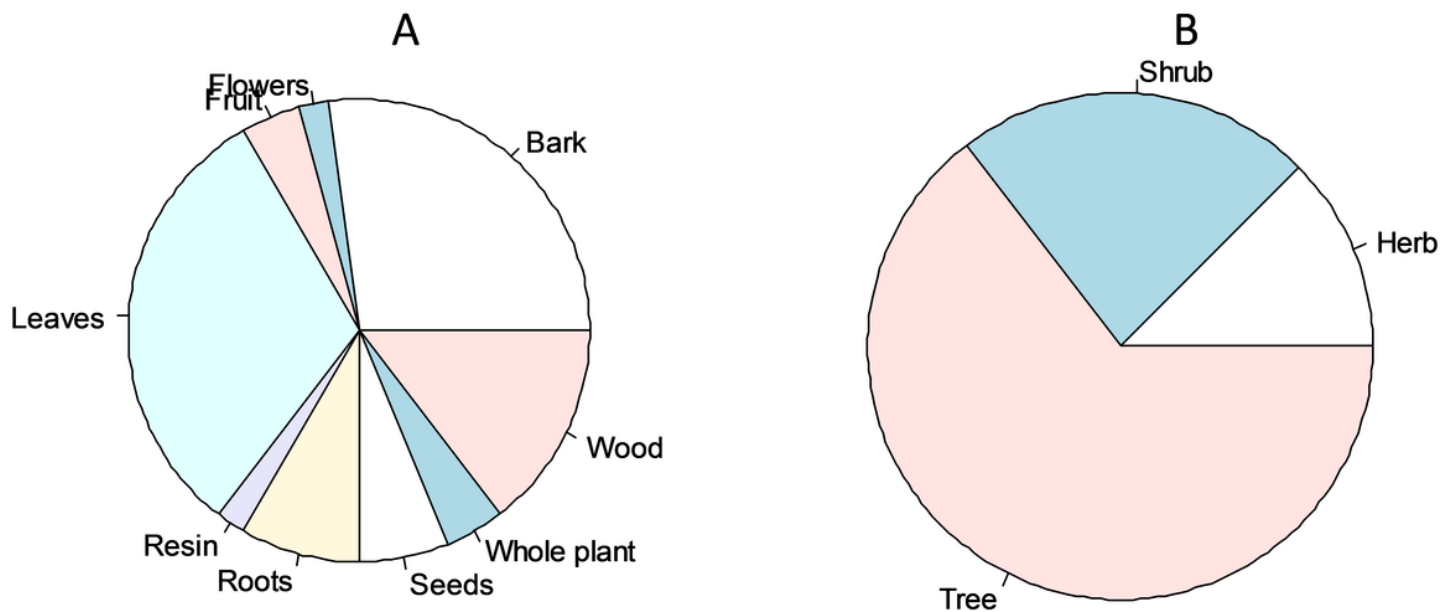


Figure 2

Proportion of (A) Plants parts, (B) Growth forms of plant species used as a traditional cosmetic among the Oromo women in the study area

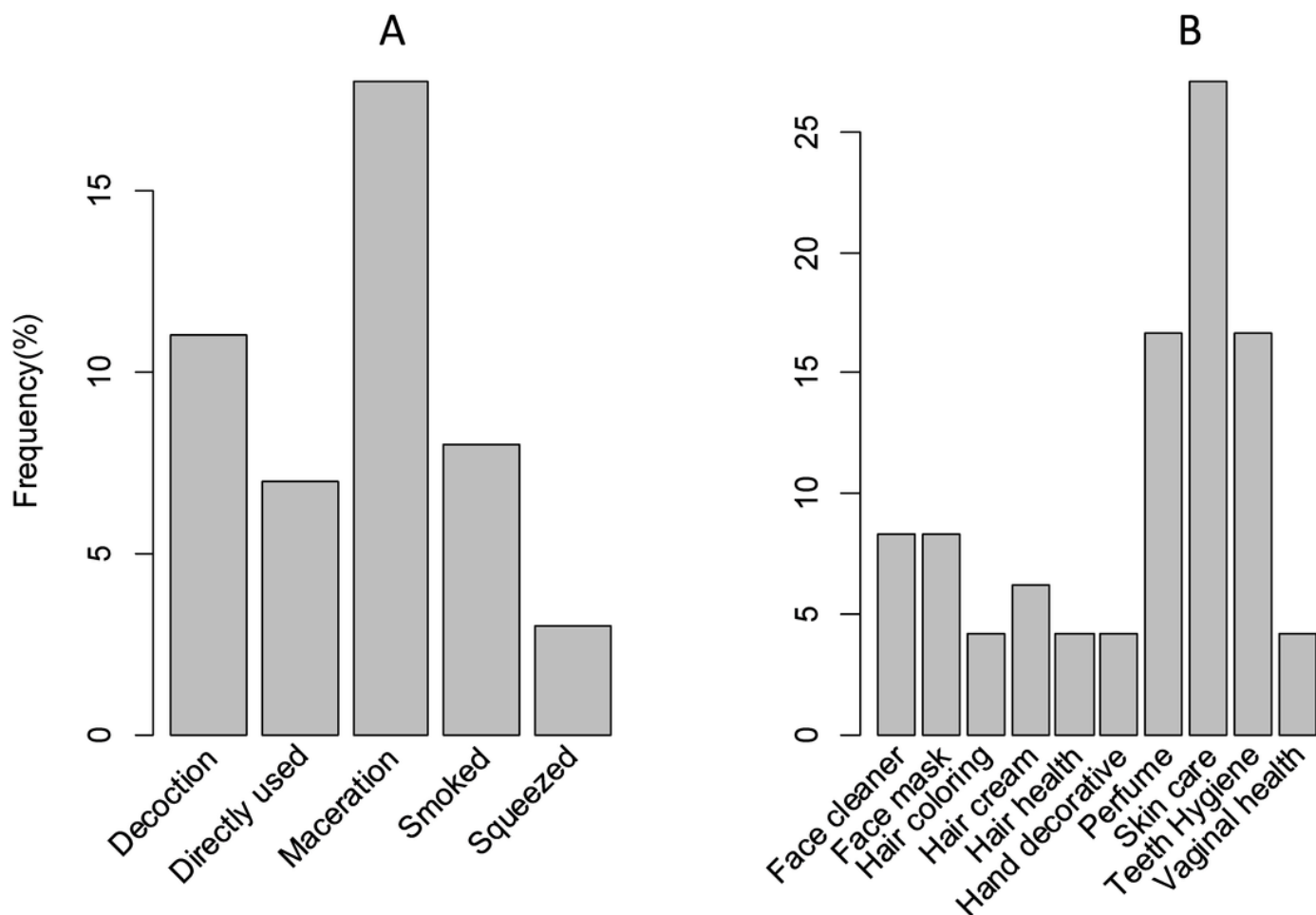


Figure 3

Methods of preparation (A), and major use categories (B) of the plant based traditional cosmetics products among Oromo women in Madda Walabu District of Bale Zone

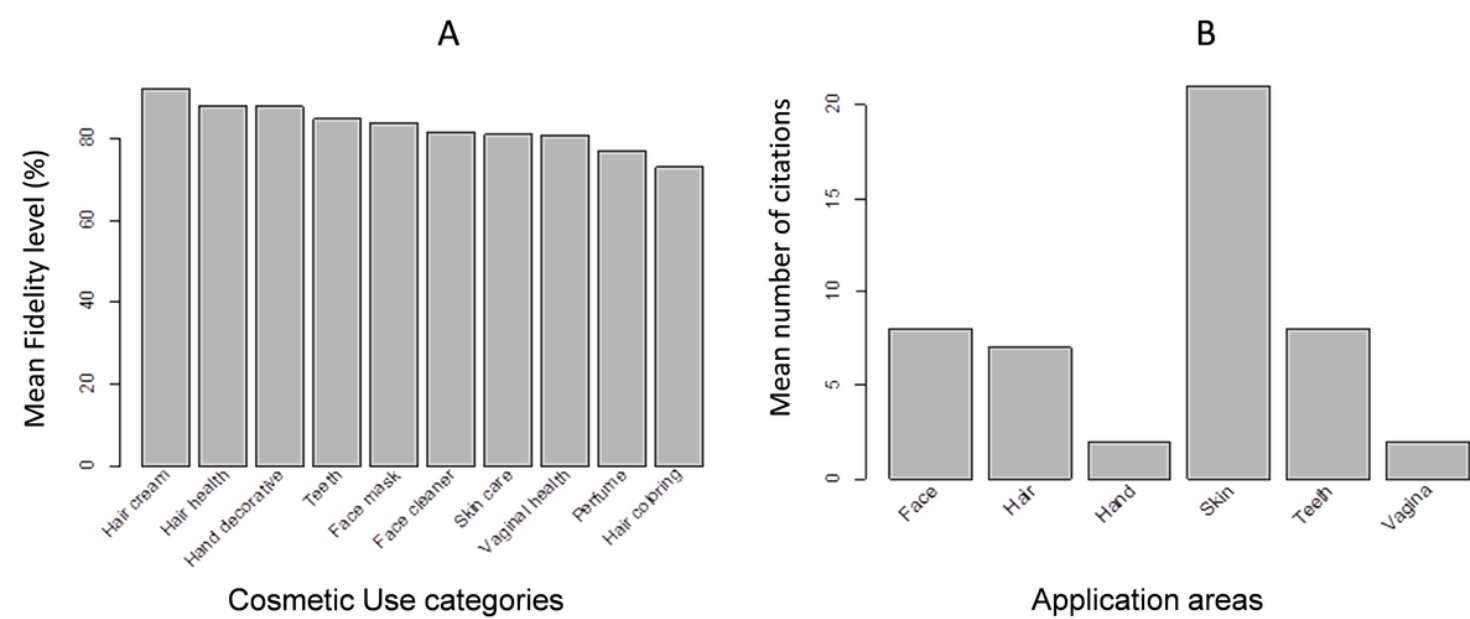


Figure 4

Major cosmetic use categories (A) and the main cosmetic body application areas (B) among the Oromo women in the study area

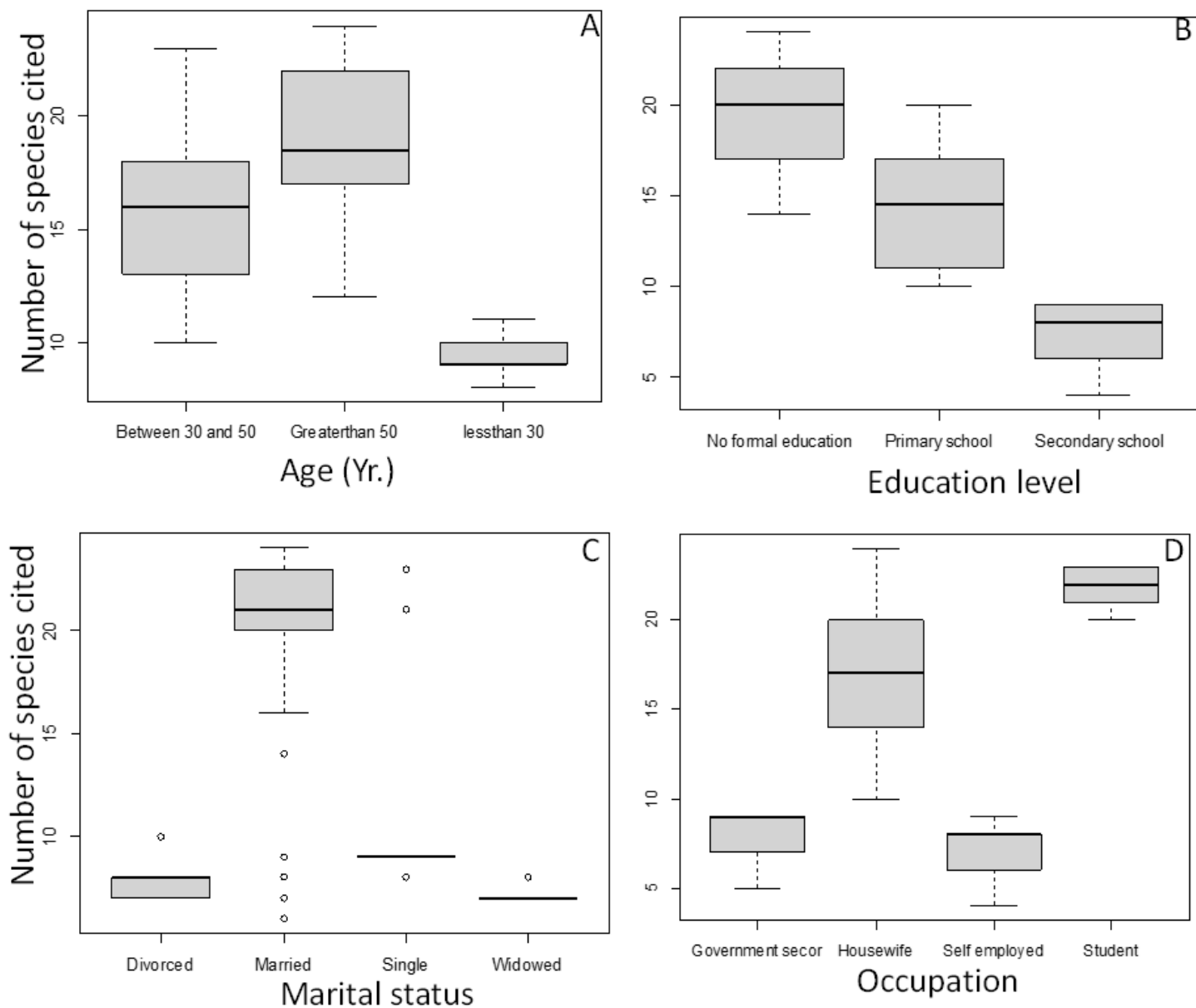


Figure 5

Variation in the use of traditional cosmetics based on (Age, (B) Level of education, (C) Marital status, and (D) Occupation among the Oromo women in Madda Walabu District, Bale Zone, Oromia Regional state, Ethiopia.

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