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Botanicals used for cosmetic purposes by Xhosa women in the Eastern Cape, South Africa

J.L. Mwinga [a], N.S. Makhaga [b], A.O. Aremu [a,c,*], W. Otang-Mbeng [d,*]

[a] Indigenous Knowledge Systems (IKS) Centre, Faculty of Natural and Agricultural Sciences, North-West University, Private Mail Bag X2046, Mmabatho 2735, South Africa
[b] P.O Box 2187, King Williams Town 5600, South Africa
[c] Food Security and Safety Niche Area, Faculty of Natural and Agricultural Sciences, North West University, Private Mail Bag X2046, Mmabatho, North West Province, South Africa
[d] School of Biology and Environmental Sciences, Faculty of Agriculture and Natural Sciences, University of Mpumalanga, Private Bag X 11283, Mbombela 1200, Mpumalanga Province, South Africa

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ABSTRACT

Despite the rich history of traditional medicine and biodiversity in the Eastern Cape Province of South Africa, few studies exist with regard to the use on traditional medicinal plants for cosmetic purposes. Thus, this study explored the indigenous knowledge of traditional cosmetic plants used by the Xhosa women of the Eastern Cape Province of South Africa. An ethnobotanical survey using semi-structured questionnaires was used to document the indigenous knowledge held by Xhosa women of the Eastern Cape Province on herbal cosmetics. Eighty-eight participants were interviewed from October to November 2017, and August 2018 through non-probability convenience and purposive sampling methods. A total of 16 plants belonging to 14 families were recorded as indicated by the 88 Xhosa women aged from 16 to 85 years. *Cassipourea flanaganii* had the highest frequency of citation while *Hypoxis hemerocallidea* had the highest use value. Documented plant parts included the bark (25%), bulb (16.67%), fruit (13.54%), seeds (6.25%), leaves (15.63%) and tubers (14.58%). The cosmetic preparations were mostly prepared through maceration, crushing and infusion. These preparations were predominantly applied topically while a few were taken orally. The local cosmetic applications of the plants included uses for changing skin complexion, sunlight protection, treating pimples and body rashes, removing spots, making skin soft, treating sunburns, making skin smooth and maintaining a healthy skin. Skin complexion recorded the highest citation frequency. Medicinal plants still play a major role in the local cosmetics industry of the Xhosa community in the Eastern Cape. As a result, their sustainable utilization should be encouraged. There is also need for more studies to compliment and validate the *in vitro* and *in vivo* cosmetic potential of the plant extracts.

1. Introduction

There is a long history of the use of indigenous plants by people on all continents for the treatment of ailments (Acharya and Shrivatsava, 2008). People from different local communities across the world possess indigenous knowledge of various medicinal plants where they use their experiences to categorize plants and associated parts used to deal with different ailments (Omoruyi et al., 2012). Medicinal plants have been widely used in therapy within the traditional health care system in South Africa. For many years, the Xhosa people, who are the major inhabitants of the Eastern Cape Province of South Africa, relied on the traditional knowledge they had on medicinal plants to meet their health requirements (Bhat, 2013). The ability of plants in the form of herbal extracts to calm, smooth, restore, heal and protect the skin also make them good sources for cosmetic products (Patel et al., 2013). With cosmetic formulations administered topically for cleansing, beauty enhancement and altering a person's appearance, a close association exists between a person's looks and their health (Dlova et al., 2015). There is a growing demand and use of herbal cosmetics for skin beauty purposes due to their efficacy, safety, formulation stability and rapid metabolism when applied to the skin (Ashawat et al., 2009; Kurata, 1994). In South Africa, there is a growing interest in the health benefits of indigenous plants and this has led to an increasing number of published articles claiming the usefulness of indigenous plants in skin care and cosmetics (Lall and Kishore, 2014).

Globally, plants are used for various cosmetic purposes including UV protection, wound healing, concealing skin blemishes and pimples, treating and preventing acne and eczema, skin lightening, skin moisturizing, depigmentation, antimicrobial activity, perfume, hair cleanser, hair growth, anti-dandruff, skin discoloration, anti-aging, skin toner, treating freckles, facial cleanser, smoothening of skin, tightening of breasts and removing spots on the skin (Lall and Kishore, 2014;

* Corresponding authors at: Indigenous Knowledge Systems (IKS) Centre, Faculty of Natural and Agricultural Sciences, North-West University, Private Mail Bag X2046, Mmabatho 2735, South Africa.
E-mail addresses: Oladapo.aremu@nwu.ac.za (A.O. Aremu), Wilfred.mbeng@ump.ac.za (W. Otang-Mbeng).

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Mapunya et al., 2012; Patel et al., 2012; Sharma and Kumar, 2013; Van Wyk and Gericke, 2000).

The Eastern Cape Province is well-known for its rich floral biodiversity (Phillipson, 1987). The indigenous people of Eastern Cape Province still use and prefer certain traditional plant cosmetics for beauty, health, well being and as social status indicators (Dold and Cocks, 2005). Most of these plants are collected from the wild and hence are readily available locally and are also inexpensive. Some of the plants are bought from local markets. Despite the fact that the Eastern Cape Province is endowed with a rich history of traditional medicine and biodiversity, few studies exist with regard to the use of traditional plants as cosmetic among the Xhosas (Afolayan et al., 2014; Dold and Cocks, 2005; Grierson and Afolayan, 1999; Thibane et al., 2019). Most of the studies do not discuss the conservation status of these cosmetic plants. As emphasized by Moyo et al. (2015), sub-Saharan Africa has a rich biodiversity with a considerable number of endemic plant species with therapeutic/medicinal potential. However, the issue of conservation has not received much attention when compared to their therapeutic/medicinal uses. The conservation of the medicinal plants plays a major role in developing and sustaining the economic status of the local communities. Non-sustainable harvesting of medicinal plants threatens their existence (Mander, 1998) and if the whole plant is heavily exploited, it can lead to its extinction. Even though the indigenous knowledge and practice of herbal cosmetics can be useful in the cosmetic industry, the indigenous knowledge itself is poorly investigated with little documentation. This can lead to decline of its awareness of existence among the younger generation. This study was designed to record the local knowledge on herbal cosmetics from Xhosa women of the Eastern Cape Province of South Africa with an aim of documenting and preserving this indigenous knowledge. In addition, the conservation status of these plants and the conservation strategies applied by Xhosa women of the Eastern Cape Province was highlighted.

2. Materials and methods

2.1. Study area

The Eastern Cape is the second largest province in South Africa after Northern Cape by surface area, and it has the third largest population. It is largely dominated by the AmaXhosa tribe with IsiXhosa being the main medium of expression. The Eastern Cape Province falls within the latitudes 30°00′ to 34°15′S and longitudes 22°45′ to 30°15′E (Grierson and Afolayan, 1999). The study was conducted in Amathole district municipality in three local municipalities namely Nkonkobe, Amahlathi and Great Kei (Fig. 1).

2.2. Ethnobotanical survey

An ethnobotanical survey was conducted from October to November 2017 and August 2018 in eight villages namely Qanda, Cwarhu, Kieskammahoek, Burnshill, Ngxondoreni, Quzini, Toleni and Etyiweni (Table 1). Non-probability sampling (including convenience and purposive sampling) was used to select the women to be interviewed in the selected villages (Palinkas et al., 2015). A team of research assistants was formed who helped in identifying knowledge holders in every location. Xhosa women (knowledge holders) aged between 16 and 85 years were interviewed using semi-structured questionnaires. The first section of the questionnaire captured the socio-demographic information of the participant and the second section captured the indigenous practices used for herbal cosmetics by Xhosa women. The following data were recorded: the local name of the plant, where the plant is collected

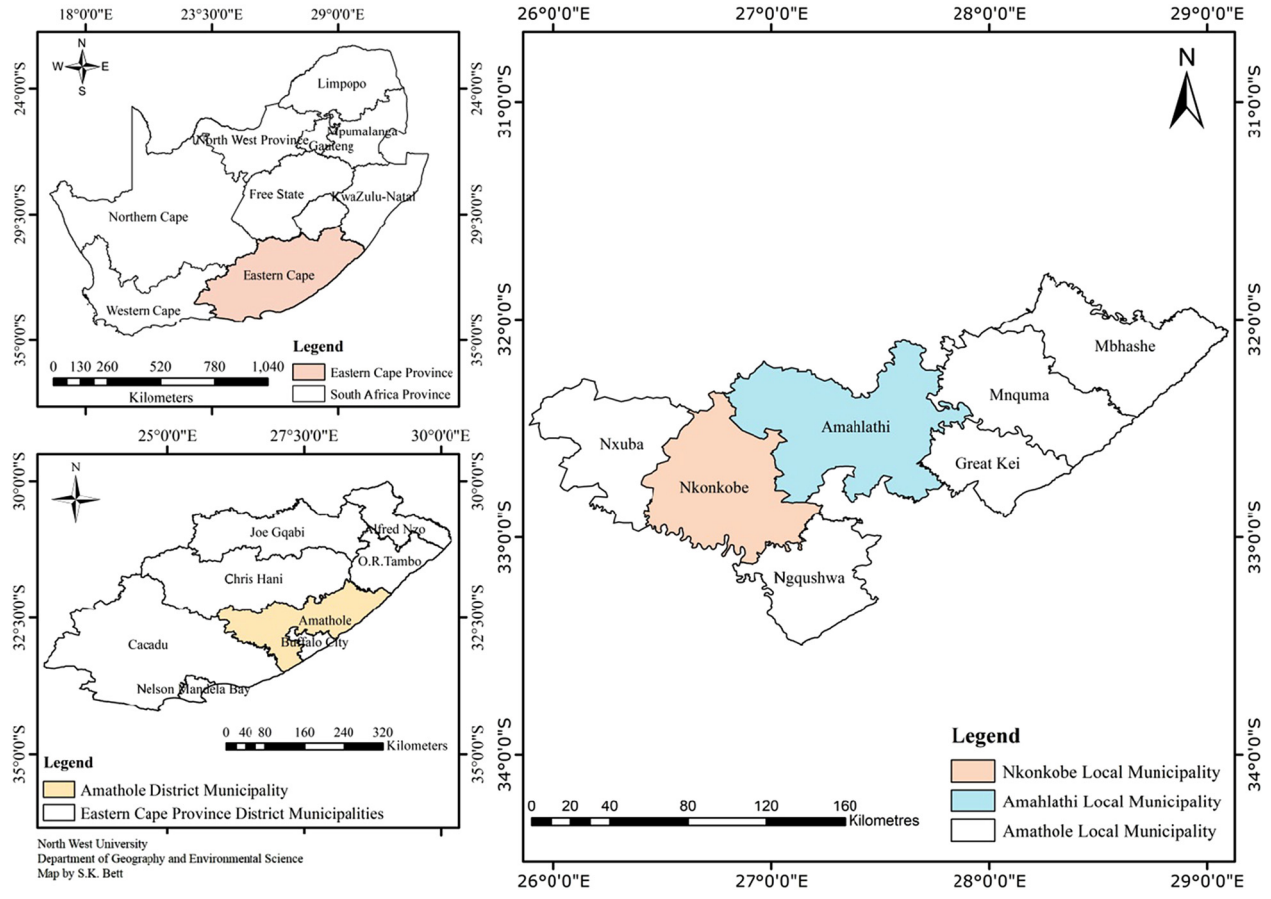

Fig. 1. Study areas located in Amathole District municipality with shades on Nkonkobe, Amahlathi and Great Kei local municipalities, Eastern Cape, South Africa

Table 1
Socio-demographic characteristics of participants (n = 88).

Feature		Number of participants	Frequency (%)
Age			
	16–29	3	3.41
	30–45	23	26.14
	46–59	19	21.59
	Over 60	43	48.86
Marital status			
	Single	33	37.5
	Married	37	42.05
	Widowed	17	19.32
	Divorced	1	1.14
Education level			
	None	50	56.82
	Matric	33	37.5
	Tertiary	5	5.68
Race			
	African	87	98.86
	Colored	1	1.14
Municipality	Location		
Amahlathi	Burnshill	14	15.91
	Quzini	10	11.36
	Ngxondoreni	7	7.95
Nkonkobe	Cwarhu	29	32.95
	Qanda	10	11.36
	Kieskammahoek	7	7.95
Great Kei	Toleni	5	5.68
	Etyiweni	6	6.82

from, how the plant is collected, the parts of the plant used, the mode of preparation of the herbal cosmetics, the method of application and cosmetic use of the plant, how the final product is preserved and how indigenous knowledge of cosmetic plant is passed from one generation to another. Field notes were also used to capture additional information provided by the participants. Visual images were captured by the researcher with the permission of the participants. A field assistant fluent in the local language assisted the participants who were not fluent in English.

The interviews were supplemented by field walks. During the field walks, plants were collected under the supervision of the knowledge holders. Voucher specimens for the collected plants were prepared and deposited at the South Africa National Biodiversity Institute (SANBI, Pretoria, South Africa) for identification and reference purposes. Preliminary identification of the plants was done according to scientific works of Van Wyk et al. (1997) and Dold and Cocks (1999). Ethical clearance (NWU-00557-18-A9) was obtained from the ethics committee, Faculty of Natural and Agricultural Sciences, North West University, Mmabatho, South Africa. Permission to interview knowledge holders was obtained from the traditional authority and the participants gave their consent prior to the data collection.

2.3. Data analyses

Descriptive statistics was used to summarize the data concerning plant uses. The collected data were compiled in a database in an excel workbook coded and then categorized according to their main themes (Heckathorn, 2011). The data were analyzed using frequency, frequency of citation (FC) and use value (UV). The percentage of knowledge holders claiming the use of a certain plant species or plant organ was calculated as:

$$F\,(\%) = \frac{Np}{N} \times 100$$

where Np is the number of participants that claim a particular use of a plant species or plant organ as cosmetics and N is the total number of participants.

The frequency of citation of the plant species was calculated as:

$$FC = \frac{\text{no. of times a particular species was mentioned}}{\text{total number of times all species were mentioned}} \times 100$$

The use value implicates the relative importance of plants known locally hereby referring to the local communities of the Eastern Cape Province. As indicated by Gazzaneo et al. (2005), it was calculated as shown below:

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

where Ui is the number of uses mentioned by each participant for a given species and N is the total number of participants.

3. Results and discussion

3.1. Socio-demographic information

The socio-demographic data collected include age, marital status, educational level and race of the participants (Table 1). The ethnobotanical information revealed that the indigenous knowledge on herbal cosmetic is endowed mostly in the elderly women than in the younger women. This poses a threat to the existing indigenous knowledge of herbal cosmetic because the knowledge can get extinct in the near future if not properly preserved. The younger women are slowly losing interest in the indigenous knowledge. This loss of interest in indigenous knowledge by the younger generation can be attributed to urbanization, industrialization and changes in lifestyles in the modern world (Moyo et al., 2015; Teklehaymanot and Giday, 2007).

3.2. Diversity of plant species used for cosmetic purposes

A total of 16 plant species belonging to 14 families were reported (Table 2). The most represented families were Xanthorrhoeaceae and Amaryllidaceae with each having two species. The rest of the families had one species each. Xanthorrhoeaceae family consists of succulent plants that thrive in different climatic conditions and is an important family within the Eastern Cape flora (Van Wyk and Van Wyk, 1997). Traditional knowledge and the use of plant-based extracts play a major role in the cosmetic industry among the Xhosa women. This is important because plants are often quickly accessible and affordable to the local communities. Documentation of ethnobotanical data is important in understanding the relationship between human–plant and human–biodiversity relations (Ramakrishnappa, 2002). It was also observed that indigenous medicinal plants play a big role not only in meeting primary health care needs, but also in cleansing of the body (Cocks and Dold, 2009). Ethnobotanical work is intended to bring to the light traditional knowledge on plant use with its cultural significance with an aim of developing better ways of natural resource exploitation or to propose their sustainable management (Zamora-Martinez and De Pascual, 1992). The study identified 10 new plant species that are used by the Xhosa women for cosmetic purposes that had not been documented in previous ethnopharmacological literature of the Eastern Cape Province, South Africa. These plants include *Exomis microphylla* var. *axyriodes* (Fenzl ex Moq.) Aellen, *Calpurnia aurea* (Aiton) Benth., *Persea americana Mill., Rhoicissus tridentata* (Lam.) Wild & R.B. Drumm., *Agapanthus praecox* Willd., *Dioscorea sylvatica* Eckl., *Protorhus longifolia* (Bernh.) Engl., *Ptaeroxylon obliquum* (Thunb.) Radlk., *Schotia afra* Thunb. and *Agapanthus africanus* (L.) Hoffmans. In the Eastern Cape Province, the fresh juice from leaves of *Aloe ciliaris* Haw. and *Aloe ferox* Mill. is applied topically to treat rashes, pimples and dry skin, and also to change skin complexion (Grierson and Afolayan, 1999; Thibane et al., 2018). Apart from the seeds (as recorded in this current study), the Xhosa people also apply the paste made from ground bark

Table 2
Overview of plants used as cosmetics by Xhosa women in the Eastern Cape, South Africa. FC = Frequency of Citation.

Scientific name/Voucher specimen/Family	Local name	Plant life form	Part used	FC	Use value	Mode of preparation	Mode of application	Cosmetic uses
Agapanthus africanus (L.) Hoffmans. (JL13) Amaryllidaceae	Isicithi/Isicakathi	Herb	Leaves	0.93	0.011	Crushing, Maceration. Infusion	Topical, Oral	Treating body rashes
Agapanthus praecox Willd. (JL14) Amaryllidaceae	Umkhondo	Herb	Roots	0.93	0.011	Crushing, Maceration	Topical	Treating pimples
Aloe ciliaris Haw. (JL10) Xanthorrhoeaceae	Intelezi	Herb	Roots	1.85	0.034	Crushing, Maceration	Topical	Changing skin complexion
Aloe forex Mill. (JL07) Xanthorrhoeaceae	Ikhala	Herb	Leaves	2.78	0.034	Crushing	Topical, Oral	Healthy skin, removing spots, treating pimples
Calpurnia aurea (Aiton) Benth. (JL05) Leguminosae	Umbethe	Shrub	Leaves	0.93	0.011	Crushing	Topical	Treating pimples
Cassipourea flanaganii (Schinz) Alston (JL04) Rhizophoraceae	Ummemezi	Tree	Seeds	26.85	0.057	Crushing, Maceration	Topical	Changing skin complexion, sunlight protection
			Bulb			Crushing, Maceration	Topical	Treating pimples, changing skin complexion, sunlight protection
			Leaves			Crushing	Topical	Sunlight protection, changing skin complexion, treating pimples, removing spots
			Bark			Crushing, Maceration	Topical	Changing skin complexion, sunlight protection, removing spots, treating pimples, making skin smooth
Dioscorea sylvatica Eckl. (JL09) *Dioscoreaceae*	Sikolpati	Shrub	Bulb	7.41	0.034	Crushing, Maceration	Topical	Treating body rashes, treating pimples, changing skin complexion
Exomis microphylla var. *axyriodes* (Fenzl ex Moq.) Aellen (JL02) Amaranthaceae	Umvenyathi	Shrub	Leaves	2.11	0.011	Crushing, Maceration	Topical, Oral	Treating body rashes
Hydnora africana Thunb. (JL12) Hydnoraceae	Umavumbaka	Herb	Roots	4.23	0.034	Crushing, Maceration	Topical	sunlight protection, removing spots, treating pimples
Hypoxis hemerocallidea Fisch., C.A. Mey. & Avé-Lall. (JL01) Hypoxidaceae	Inongwe	Herb	Tuber	20.37	0.078	Crushing, Maceration, Infusion	Topical, Oral	Changing kin complexion, treating pimples, removing body rashes, making skin soft, sunlight protection, treating sunburns
			Bark			Crushing, Maceration	Topical	Changing skin complexion, treating body rashes, treating pimples, sunlight protection
			Leaves			Crushing, Maceration	Topical, Oral	Removing spots, treating body rashes
Persea americana Mill. (JL06) Lauraceae	Avocado	Tree	Fruit	10.19	0.068	Maceration	Topical	Making skin soft, changing skin complexion, sunlight protection, treating pimples, removing spots, making skin smooth
Protorhus longifolia (Bernh.) Engl. (JL15) Anacardiaceae	Izitlwa	Tree	Leaves	0.93	0.011	Crushing, Maceration	Topical	Sunlight protection
Ptaeroxylon obliquum (Thunb.) Radlk. (JL11) Rutaceae	Umthathi	Tree	Bark	0.93	0.011	Crushing, Maceration	Topical	Removing spots
Rhoicissus tomentosa (Lam.) Wild & R.B. Drumm. (JL08) Vitaceae	Chithibhunga	Herb	Bulb	4.23	0.034	Crushing, Maceration	Topical	Treating body rashes, changing skin complexion, sunlight protection
Schotia afra (L.) Thunb. (JL16) Leguminosae	Umgxam	Shrub	Bark	0.93	0.011	Crushing, Maceration	Topical	Sunlight protection
Spirostachys africana Sond. (JL03) Euphorbiaceae	Umthombothi	Tree	Seeds	3.71	0.034	Crushing, Maceration	Topical	Treating pimples, treating body rashes, removing spots

powder of *Cassipourea flanaganii* (Schinz) Alston topically to act as sunscreen, to improve skin complexion and also to conceal skin blemishes (Bhat, 2013; Dold and Cocks, 2005; Mahachi, 2013; Thibane et al., 2018). The infusion of the bulb is applied topically to protect against sunburns (Bhat and Jacobs, 1995). Apart from the root (as recorded in this current study), the Xhosa people also apply on the skin a thin reddish paste made from the macerated fruiting body of *Hydnora africana* Thunb. to treat and prevent skin blemishes (Dold and Cocks, 2005). In this study, preparation and application of the cosmetic products of *Hypoxis hemerocallidea* Fisch., C.A.Mey. & Avé-Lall. was recorded. Similar findings were observed in the Eastern Cape Province by Mahachi (2013) and Dold and Cocks (2005). In addition to the seeds (as recorded in this current study), the Xhosa people also use the macerated powdered bark of *Spirostachys africana* Sond. by applying it topically on the skin to treat rashes and pimples (Mahachi, 2013). They also apply topically the paste made from the powdered wood to treat rashes (Dold and Cocks, 2005). In Eastern Cameroon, the fruit of *Persea americana* Mill. is prepared and the resultant paste is applied topically for body, hair and visage care (Fongnzossie et al., 2017). In the study area, similar preparation and application method was indicated by the participants. In Missenyi District of Tanzania, the fruit of *Persea americana* is mixed with egg yolk and applied on hair as moisturizer and anti-dandruff (Maregesi et al., 2014).

The reported plant species were of different plant life forms. The most abundant plant life forms were herbs, accounting for 43.75% of the recorded plant species. Trees and shrubs accounted for 31.25% and 25%, respectively. The abundance of herbaceous plants makes them readily available and utilized by the locals (Addo-Fordjour et al., 2008). Some of the plants were collected just within the homesteads while others as far as 5 km away and from different locality such as gardens, roadside, riverside and the wild.

3.3. Mode of transmission of indigenous knowledge

The indigenous knowledge on the use of plants for cosmetic purposes was reported to be passed from the grandmothers or mothers to their daughters through storytelling. Given that women are the caregivers in the households, it is likely for them to pass the knowledge to their daughters. Previous study by Madikizela et al. (2012) indicated that women are the ones more entrusted in passing on the indigenous knowledge than men.

3.4. Mode of utilization of plants

3.4.1. Plant parts used

The survey revealed that different parts of the plants were used for cosmetic purposes (Fig. 2). These parts included fruit, leaves, roots, bulbs, seeds, bark and tubers. The top four frequently used parts were bark (22.43%), bulbs (14.95%), leaves (14.02%) and tubers (13.08%). This was congruent with other ethnobotanical studies (Adediwura et al., 2015; Bhat, 2014; Fongnzossie et al., 2017; Mahomoodally and Ramjuttun, 2016; Thibane et al., 2019) where both the bark, bulbs, leaves, tubers and roots were the most common plant parts used to prepare the extracts. According to the knowledge holders, bulbs or tubers are regarded as the most valuable plant materials as they claim that they contain the highest concentration of healing agents (Louw et al., 2002). Underground parts of the plants have a higher amount of active ingredients than other parts and hence are regarded as the most important parts of a plant as highlighted by Bussmann and Sharon (2006) and Maroyi (2013). Leaves were among the commonly used parts because they are easily collected than the underground parts (Giday et al., 2009). Leaves being active in photosynthesis and the creation of pharmacologically active phytochemicals give them the potential of their remedial benefits (Ghorbani, 2005; Samoisy and Mahomoodally, 2015).

3.4.2. Mode of preparation

The herbal extracts were prepared mainly in three ways: crushing, maceration and infusion; with maceration having the highest frequency (50.76%) while crushing and infusion had frequencies of 47.21% and 2.03%, respectively. For maceration, water was mostly mixed with the herbal extracts to soften them. The resultant paste was applied topically. For infusion, the herbal extract was also mixed with water and taken orally. According to Samy and Gopalakrishnakone (2010), traditional healers prepare a wide range of pastes, healing juices and crude extracts from various herbs by using water extracts. The herbal extracts were mostly prepared in aqueous solution. According to Nethathe and Ndip (2011), the use of water extract is very effective.

3.4.3. Mode of application

The cosmetic preparations obtained were mostly applied topically (92.24%) on the body especially the face with few cosmetics preparations taken orally (7.76%). Those taken orally were prepared from *Hypoxis hemerocallidea*, *Exomis microphylla* and *Aloe ferox*. When the herbal extract is applied topically, the active ingredients are easily absorbed into the underlying tissues (Van Wyk et al., 2009). According to the recorded ethnobotanical literature, topical application is the most commonly used mode of application, as its ensures direct and quick contact of the specific plant compounds to the site of action (Hutchings et al., 1996; Rabe and van Staden, 1997; Van Wyk et al., 2009; Von Koenen, 1996).

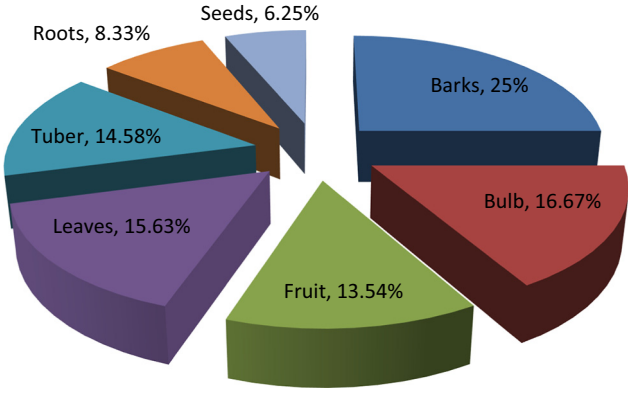

Fig. 2. Plant parts used in the preparation of cosmetics by Xhosa women in the Eastern Cape, South Africa, n= 96.

3.5. Important plants used for cosmetics by the Xhosas based on ethnobotanical indices

Three plants namely *Hypoxis hemerocallidea*, *Cassipourea flanaganii* and *Persea americana* are considered of high importance cosmetically within the region. *Cassipourea flanaganii*, a tree, had the highest FC with 26.85% followed by *Hypoxis hemerocallidea* (20.37%) which is a tuberous herb. *Hypoxis hemerocallidea* also known as the African potato has been widely used for skin beauty. The paste made from its tuber is mostly applied topically to improve skin beauty and remove pimples. It also absorbs excess skin oils (Dold and Cocks, 2005; Mahachi, 2013).

Hypoxis hemerocallidea and *Persea americana* recorded the highest use values; *Hypoxis hemerocallidea* had a use value of 0.078, with six cosmetic applications namely; changing skin complexion, sunlight protection, treating pimples, treating body rashes, removing spots and making the skin soft. *Persea americana* recorded the second highest use-value (0.068) with five cosmetic applications namely; to improve skin complexion, sunlight protection, treating pimples, removing spots and making the skin soft. Most of the cited plants were reported to be used for skin complexion followed by sunlight protection with citation frequencies of 40.82% and 22.45% respectively (Table 3). Pimples were treated by 10 plants followed by sunlight protection of which 9 plants were used. As recorded in other literature, the bark of *Cassipourea flanaganii* is air dried, powdered then mixed with water and the paste applied topically to improve beauty, lighten skin and act as a sunscreen (Bhat, 2013; Dold and Cocks, 2005; Mahachi, 2013; Thibane et al., 2019). The infusion of its bulb is also applied topically to protect against sunburn (Bhat and Jacobs, 1995). Avocado oil is easily absorbed by the skin which is a great value to the cosmetic industry. According to Swisher (1988), the avocado oil can be used as a skin moisturizer, cleansing cream, make-up base and also as a sunscreen.

3.6. Conservation status of the reported plants

In the current study, a total of seven plants were reported to be harvested as whole plant which accounts for 43.75% of the reported plants (Table 2). Eight plants have been reported whose underground parts (bulb, tuber or roots) are being harvested and used in cosmetics and this influences their future existence. The majority (about 80%) of the participants have observed the scarcity of several plants based on the relatively distance they traveled to access some of the plants (Table 4). In the current study, *Cassipourea flanaganii*, one of the plants with the highest frequency of citation and use value, was reported to be scarce and was considered as "very far" (more than 5 km away) and difficult to find. The distance required to access *Dioscorea sylvativa* was also considered as "very far". According to the participants, *Hypoxis hemerocallidea* are not easily located as they have to travel more than 2 km for collection. Only one plant (*Aloe forex*) was considered as "not far" (available within 2 km) and easily accessible by the participants. These aforementioned observations are congruent with the Red List of South African Plants. For instance, *Cassipourea flanaganii* and *Dioscorea*

Table 3
Frequency of citation plant and non-plant based cosmetic applications by Xhosa women in the Eastern Cape, South Africa.

Type of cosmetic application	Number of plants and non-plant used	Frequency of citation (%)
Skin complexion	6	40.82
Sunlight protection	9	22.45
Treating pimples	10	14.97
Treating rashes	8	10.20
Removing spots	8	7.48
Soft skin	2	1.36
Healthy skin	1	0.68
Smooth skin	2	1.36
Treating sunburns	1	0.68

Table 4
Conservation status of plants used as cosmetics by Xhosa women in the Eastern Cape, South Africa.

Scientific name	*Status (Raimondo et al., 2009)	**Estimated distance from homestead as reported by knowledge holder where plant can be found
Agapanthus africanus	LC	F
Agapanthus praecox	LC	VF
Aloe ciliaris	LC	F
Aloe forex	LC	NF
Calpurnia aurea	LC	VF
Cassipourea flanaganii	EN A4acd; C1 + 2a(i)	VF
Dioscorea sylvatica	VU A2cd	F
Exomis microphylla	LC	VF
Hydnora africana	LC	F
Hypoxis hemerocallidea	Declining	F
Persea americana	Not available	F
Protorhus longifolia	LC	F
Ptaeroxylon obliquum	LC	F
Rhoicissus tridentata	LC	VF
Schotia afra	LC	F
Spirostachys africana	LC	F

* Status: LC = Least Concern, VU = Vulnerable, EN = Endangered.
** Estimated distant: NF, Not far = not more than 2 km; F, far = more than 2 km but less than 5, VF, very far = more than 5 km.

sylvativa are of great conservation concerns due to the enormous strains on the wild populations (Raimondo et al., 2009). *Cassipourea flanaganii* meets some of the five IUCN criteria (A4acd; C1 + 2a (i)) for endangered species and is therefore facing a very high risk of extinction in the wild. *Dioscorea sylvatica* is classified as vulnerable species falling under categories A2cd and D2 of the IUCN criteria. Currently, the population of *Hypoxis hemerocallidea* is declining in the wild (Table 4). *Hypoxis hemerocallidea* (distributed in at least 20 African countries) is listed among 51 African most important medicinal plants and their existence is under threat due to over-exploitation for their medicinal purposes (Brendler et al., 2010).

The participants showed concern on the dwindling of these medicinal plants. As a means of mitigating the difficulty of accessing these plants, they discourage collecting these plants at a certain period of the year especially during winter. They also discourage harvesting of the whole plant. Sometimes they opt to use non-plant materials to achieve the same cosmetic purposes. The use of alternate plant parts would be key as a sustainable means of conserving medicinal plants (Jena et al., 2017). The over-exploitation of medicinal plants for commercial trade in the Eastern Cape Province poses a threat to the existence of many species (Cocks and Dold, 2009) and hence implementation of conservation policies and programmes by botanists, conservationists and other stakeholders is important. Increased public awareness would help in eradicating the prejudice against cultivation of medicinal plants.

3.7. Non-plant materials used for cosmetic purposes

Some interviewed participants reported the use of non-plant materials for cosmetic uses. Nine participants reported the use of *Ganoderma* sp., locally known as "Isibindi." The species is mostly crushed, then macerated and applied topically on the skin. The cosmetic uses of *Ganoderma* sp. include ultraviolent protection, changing skin complexion, treating pimples and removing body spots. One participant reported the use of a white stone collected from the river, locally known as "Ingxwala". The stone is crushed then mixed with water and applied on the face to improve skin complexion. A processed powder locally known as "Umthoba" was also reported to be used for cosmetic purposes. The powder is mixed with water then applied topically to improve skin complexion. According to Matike et al. (2010), in other parts of Africa, red, white, yellow and other shades of clay, in combination with other natural substances have also been applied topically for beauty purposes. A study by Pieroni et al. (2004) showed that animal and mineral derived products (ashes, bees wax, brick, clay, charcoal, cow feces, egg yolk, honey, sand, sea stone, pig fat, urine) have also been used for beauty purposes. They are mostly applied topically on the skin to give a cosmetic effect. The use of non-plant material to achieve the same cosmetic function supports the sustainable use of medicinal plants.

4. Conclusion

Sixteen plant species belonging to fourteen families were identified and documented as being used for cosmetic purposes among the Xhosa women in the Eastern Cape Province. *Cassipourea flanaganii* was the most cited plant species while *Hypoxis hemerocallidea* had the highest use-value. This is suggestive of the importance of these two aforementioned plants in the cosmetic industry among the Xhosa women of the Eastern Cape Province. The plants were reported for various cosmetics applications including enhancing skin complexion, sunlight protection, treating pimples and rashes as the highest cited applications. Ten new plant species were identified as remedies for cosmetic purposes. New cosmetic uses of some plants already in previous literature were also observed. The richness of this traditional knowledge of cosmetic plants in the Xhosa community points to a great potential for research and development, and the discovery of new cosmetic formulations.

Despite the establishment of modern cosmetic products in the recent years, this study has revealed that plants still play a major role in the local cosmetics industry within the Xhosa community of the Eastern Cape Province of South Africa. Hence, promoting their sustainable use is a pathway for harnessing the conservation of these plants and developing the local economy. The great biodiversity of the Eastern Cape Province remain a vast entity of unexploited medicinal plants which could be transformed to important cosmetic products. Further herbal cosmetic exploratory surveys should be conducted in other unexplored areas of the Eastern Cape Province for purposes of knowledge preservation. There is also need for more studies to compliment and validate the *in vitro* and *in vivo* cosmetic potential of these plants.

Conflicts of interest

The authors declare no conflicts of interest.

Authors' contributions

JLM with guidance from WOM and AOA conceptualized the study. JLW and NSM (knowledge holder) conducted the ethnobotanical survey while JLM analyzed the data and prepared the draft manuscript. WOM and AOA supervised the whole project and edited the manuscript. All authors approved the final manuscript.

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