Chapter 12
Sustainable Utilization of Important Medicinal Plants in Africa

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Abstract Humans have relied on medicinal plants for food, housing, clothing, and medicine since the dawn of humanity. However, following World Health Organization's support for herbal medicine development, increased awareness of their social and economic significance, and research validation of herbal remedy efficacy claims, there appears to be a renewed increase in demand for medicinal plant resources over the last few decades. This increased exploitation has resulted in the depletion and endangerment of some of Africa's most significant medicinal plant species, making it unsustainable. This chapter focuses on traditional knowledge of medicinal plants as well as the variety of important medicinal plants in Africa, contemporary trends in their use, and issues of their unsustainable exploitation. It also proffers suggestions for remedies and a path ahead to achieve a more sustainable use of medicinal plant species in Africa.

Keywords Sustainability · Utilization patterns · Africa · Medicinal plants · WHO · Traditional medicine

12.1 Introduction

Plants were previously the world's principal source of medicines. It is likely the oldest form of plant usage known to man and dates back to periods before plant domestication began (Osawaru et al. 2012, 2016). Plants have continued to provide humans with novel treatments since then, with natural products accounting for 50% of all medications in clinical use worldwide, with higher plants accounting for 25% of the total (Van Wyk et al. 2013; Ogwu et al. 2016a; Ogwu and Osawaru 2022). In many underdeveloped nations, medicinal plants serve an important role in basic healthcare (Fullas 2007). Traditional medicines are used by about 80% of people in

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poor nations due to their cost and cultural acceptance (Maroyi 2013). Herbal medicine is becoming more popular. Herbal medicine is defined by the World Health Organization (WHO) as finished, labelled medicinal products that contain aerial or underground parts of plants, or other plant materials, or combinations thereof, as active ingredients, whether in their natural state or as plant preparations (Izah and Aseibai 2018; Gamaniel 2005).

Since the dawn of time, medicinal plants have been a vital element of Africa's healthcare system. Traditional medicine's popularity can be explained by the fact that it is an integral part of the culture of those who practise it, as well as by the economic challenge: on the one hand, pharmaceutical drugs are out of reach for the poor, while on the other hand, Africa's richness and diversity of fauna and flora provide an inexhaustible source of therapies for a wide range of ailments (Ogidi et al. 2021a, 2019a). Despite this, there is a scarcity of clinical evidence to support their efficacy and safety in people. Users of traditional medicinal herbs in Africa and elsewhere are suspicious about their efficacy without this knowledge. This limits people's ability to select plants that are potentially less expensive and more accessible (Ogidi et al. 2019b, c).

Because most medicinal and aromatic plants are edible and staple foods in most poor societies, researchers have lately analysed the notion of "food as medicine" as a factor to consider in the long-term exploitation of African medicinal plant resources (HerbFest 2015). The majority of prescription pharmaceuticals in the previous century came from natural sources, namely medicinal and aromatic plants (ISSC-MAP 2007). As a result, the issues of sustainable extraction and usage of medicinal plant resources remain a hot topic that touches on plant resource security, social and economic factors, and the accomplishment of sustainable development goals in poor countries.

The focus of this chapter is on common medicinal plants from Africa that have the potential to be developed as future phytopharmaceuticals in the short and long term, the consequences of unsustainable use of these plants, and the path forward for ensuring sustainability and conservation to treat and/or manage a wide range of infectious and chronic diseases.

12.2 Indigenous Knowledge and Medicinal Plant Harvesting

In different places of the world, different tribes and ethnic groupings have retained different versions of indigenous or traditional knowledge and practices associated with diverse plant genetic resources within their vicinity (Bruchac 2014; Ikhajiagbe et al. 2021; Ahana et al. 2022). The collection, cultivation, and harvesting of medicinal plant materials used to be a limited practise in Africa, reserved for traditional healers (Van Andel and Havinga 2008; Osawaru and Ogwu 2014). Traditional health practitioners are persons who have never had official medical training, but who are trusted by their communities to meet their healthcare requirements by employing plant, animal, and mineral ingredients (Agbor and Naidoo 2011; Ogwu et al. 2017a, b; Ogwu et al. 2018a).

Indigenous knowledge (IK), such as the knowledge gained by traditional health practitioners over many generations, which includes knowledge on medicinal plants, their uses, and methods of application, is the poor's most valuable asset in the fight for survival, food and medicine production, shelter, and self-control (Senanayake 2015). Because IK is at the heart of decision-making in their communities, it is more complex than previously thought in terms of natural resources, ecological zones, aquaculture, agriculture, game management, and forestry (Senanayake 2015). Indigenous knowledge on medicinal plant identification and usage has primarily circulated among practitioners of traditional medicine or those who benefit from such practises (Regassa 2013; Hamilton 2004).

Traditional health practitioners adhere to strict traditional values around the harvesting of medicinal plants, including taboos, superstitions, conventions, and cultural beliefs, and as a result, they have helped n the conservation of medicinal plant species (Kambizi and Afolayan 2006; Williams et al. 2000; Chime et al. 2016). They only collected plant material after it had been ordained by their ancestors and after completing particular ceremonies; (1) where the root of a plant is harvested for use as medicine, cultural tradition prevents the collecting of more than two roots of the same plant at the same time, and so on. (2) For example, *Trichilia emetica* (Natal mahogany) is saved for its fruit, despite the fact that it is also employed in traditional medicine. (3) Plants like *Siphonochilus aethiopicus* (African ginger) and Alepidea amatymbica (bigger tinsel flower) are only harvested in the winter to enable seed set and proliferation throughout the summer. (4) Plants were collected with a pointed wooden digging stick or small axe, which tended to limit the quantity of bark or roots gathered, and (5) bark for treating kidney diseases was sometimes only harvested from the eastern and western sides of the tree, traditionally resembling the kidneys and thus preventing ring-barking (Van Wyk et al. 2013; Kambizi and Afolayan 2006). However, despite their medical and healing potentials, most of these medicinal plants are underutilized (Ogwu et al. 2016b, c)

Others were purposely introduced to conserve knowledge and plant material, assuring sustainable harvesting (Kambizi and Afolayan 2006; Williams et al. 2000). Several of these procedures have become obsolete since commercial harvesters have taken over the material harvesting that was formerly done only by traditional health practitioners. Species such as Siphonochilus aethiopicus and Ocotea bullata (Black stinkwood) are now threatened with extinction in Africa as a result of these banned activities. The move from subsistence usage to commercial trading in medical plants and plant parts has resulted in an increase in the quantity and frequency of medicinal plant harvesting from natural areas (Geldenhuys and Mitchell 2006).

Poverty and a high unemployment rate as a result of Africa's economic predicament have encouraged untrained and often indifferent people from disadvantaged communities to commercial plant gathering in both urban and rural locations (Williams et al. 2000; Ogwu 2019a). According to Mander et al. (2007), South Africa has over 200,000 traditional health practitioners and 63,000 commercial harvesters. Commercial harvesting methods, in contrast to the actions of traditional health practitioners outlined above, are environmentally damaging (Delveaux et al. 2009; Grace et al. 2002).

Harvesting medicinal tree bark, for example, entails removing the maximum quantity of bark as well as any tissue exterior to the secondary xylem. Gatherers create ladders to optimize the amount of bark collected from a tree when certain tree species, for example, become rare (Cunningham 1988). Some huge trees are even toppled to collect the bark from the whole length of the trunk, and juvenile trees are being stripped for their bark when the bark of older trees has been exhausted (Chungu et al. 2007). Gatherers and sellers of medicinal plants are unconcerned about the increasing scarcity of specific plant species. Increased scarcity of medicinal plant species means higher prices for merchants, increasing their profit margin (Cunningham 1988), while higher prices for gatherers function as an incentive for increased gathering rates (Cunningham 1993). Commercial harvesters are forced to expand harvesting to produce a respectable income due of the normally low prices provided to them (Monakisi 2007). Traders become worried about medical plant scarcity only when the variety of plant material accessible in their stores is impacted, since the unavailability of particular rare species or plant parts may result in the cancellation of a client's whole purchase (Cunningham 1988).

Traditional health practitioners are now purchasing plant material from commercial harvesters, which is a source of worry for environmentalists. This is especially true for traditional health practitioners working in cities, where relevant services are typically hundreds of kilometres away (Mander 1998). Plants are seen as a common property resource by commercial harvesters in both urban and rural locations, and there are no or few incentives for resource management or conventional conservation techniques (Dold and Cocks 2002). Many of Africa's medicinal tree species are multi-purpose, meaning they are utilized for more than just medicine (Van Wyk and Gericke 2007). Because of their multiple uses, multi-purpose tree species are more vulnerable to extinction than single-use tree species, necessitating strong legal restriction as well as increased conservation efforts (Primack 2012).

12.3 Some Important Medicinal Plants in Africa

Medicinal plants that are part of an African herbal pharmacopoeia with commercial importance and those plants from which modern phytopharmaceuticals have been derived were chosen for more detailed reviews based on the following criteria: medicinal plants that are part of an African herbal pharmacopoeia with commercial importance and those plants from which modern phytopharmaceuticals have been derived.

*12.3.1 Mango (*Mangifera Indica*)*

widely known as mango in English and locally as mangoro (Yoruba), mangolo (Igbo), mangwaro (Hausa), and Ogboin (Izon), belongs to the Anacardiaceae family, which includes roughly sixty genera and 600 species of tropical trees and shrubs. It is widely utilized as a food, medicinal, and wood supply. Any mango processing industry's main by-product is mango stem bark. This waste product needs a significant financial investment in order to degrade properly and avoid contamination. As a result, converting it to generate bioactive chemicals is essential to save the food processing industries a significant amount of money. Dentifrice, antiseptic, astringent, diaphoretic, stomachic, vermifuge, tonic, laxative, and diuretic are all typical uses for the plant in Nigeria. It's also used to treat diarrhoea, dysentery, anaemia, asthma, bronchitis, cough, gastrointestinal problems, hypertension, sleeplessness, rheumatism, toothache, gastrointestinal tract infections, respiratory and urinary tract infections, sore gums, sore throats, leucorrhoea, haemorrhage, and piles (Ogidi et al. 2021b).

12.3.2 Gum Arabic (Acacia senegal)

This plant is often known as gum Arabic and is native to sub-Saharan Africa's semi-desert and arid areas, although it's found all across the continent, from Southern to Northern. Northern Nigeria, West Africa, North Africa, and other places of the world utilize it as a medicinal herb (Gurib-Fakim et al. 2010). Gum arabic (or gumacacia), which is formed from a bark exudate, has been used since the first Egyptian Dynasty (3400 B.C.).

It's occasionally used to treat skin and mouth infections caused by bacteria and fungi. It has been used to heal irritated skin and calm mucous membranes in the intestines (Okoro et al. 2011; Aliyu 2006). The demulcent, emollient gumis is used both internally and topically to treat inflammation of the intestinal mucosa, such as burns, painful nipples, and nodular leprosy. It's also been used as an antitussive, expectorant, astringent, and catarrh to treat colds, coughs, diarrhoea, dysentery, gonorrhoea, bleeding, sore throat, typhoid, and urinary tract problems (Okoro et al. 2011). The gum of A. senegal has been used in the pharmaceutical industry to make emulsions, tablets, and troches (as an excipient), as a demulcent for throat and stomach inflammations, as a masking agent for harsh smelling chemicals like *Capsicum*, and as a film-forming ingredient in peel-off masks. Gum arabic is extensively utilized as a component in foods such as candy and soft drinks since it possesses glue-like characteristics that are safe to consume. Gumacacia is used in commercial emulsification for the manufacturing of drinks and flavour concentrates and is frequently utilized in organic products as a natural alternative to artificial binders (Okoro et al. 2011; Brendler et al. 2010; Aliyu 2006).

A. senegal bark extracts were tested in vitro for antibacterial activity against human pathogenic isolates, according to a recent study (Escherichia coli, Staphylococcus aureus, Streptococcus pneumoniae, Klebsiella pneumoniae, Shigella dysenteriae, Salmonella typhi, Streptococcus pyogenes, Pseudomonas aeruginosa, and Proteus vulgaris). The presence of tannins and saponins in the plant was thought to be the reason for the extract's considerable antibacterial action. Following in vitro cytotoxicity testing, it was also discovered that the plant extract may not be hazardous to humans (Okoro et al. 2011).

*12.3.3 Okra (*Abelmoschus *species)*

Okra (i.e., both *A. esculentus and A. caillei*) contains significant amounts of mucilage, fibre, proteins, oil, vitamins, and phenolic compounds wh ch are abundant in leaves, fruits, and seeds, which are ingested as vegetables (Osawaru et al. 2012; Ogwu and Osawaru 2014; Ogwu et al. 2017a, b, 2018b). Mucilage is used to raise blood volume by replacing plasma, and it also binds cholesterol, lowering the risk of heart attacks. The oil in the seed is high in linoleic acid and polyunsaturated fatty acids, both of which are good for your heart.

*12.3.4 Alligator Pepper (*Piper guineensis*)*

Piperine, wisanine dihydrocubebin, guineensine, and other compounds are found in the fruits of the plant whose fruits are often used as a chilly spice in meals. Antifungal, antimicrobial, anti-tumor, hypotension, bradycardia (slow heartbeat), immunomodulatory, antiulcerogenic, contraceptive, central nervous system depression, analgesic, antipyretic, anti-inflammatory, antioxidant, and antisickling properties are all present (Kunle and Egharevba 2013).

12.3.5 Aloe ferox*: (Bitter Aloe or Cape Aloe)*

The most prevalent Aloe species in South Africa is *Aloe ferox*, which is endemic to South Africa and Lesotho. *A. ferox* has been utilized as an alternative medicine for millennia and is one of the few plants featured in San rock drawings. In Africa and Europe, bitter latex, also known as Cape aloe, is used as a laxative medication and is said to have bitter tonic, antioxidant, anti-inflammatory, antibacterial, and anticancer qualities (Chen et al. 2012; Van Wyk 2008; Jia et al. 2008; Van Wyk and Wink 2004).

The usage of *A. ferox* as a versatile traditional medicine has led to various commercial uses, and the plant is highly appreciated in the pharmaceutical, natural health, food, and cosmetic sectors. *A. ferox* is the most often collected and sold wild species in South Africa. Since 1761, when aloe bitters was first transported to Europe, the final product derived from aloe tapping has been an important South African export product. Many rural populations rely on the aloe tapping business for their livelihood, and the sector has been formalized via the formation of cooperatives and trade agreements. It has been proposed that its commerce might have a significant impact on Africa's poverty reduction (Melin 2009; VanWyk and Gericke 2000). There are several traditional and confirmed medical applications for *A. ferox*. It's well- known for its laxative properties and as a topical treatment for the skin, eyes, and mucous membranes.

*12.3.6 Bitter Cola (***Garcinia kola***)*

The seed contains antioxidants and is used to treat sickle cell anaemia. Kolaviron, biflavanones, and tannins were said to be present (Kigigha et al. 2018; Kunle and Egharevba 2013).

*12.3.7 African Garden Egg (***Solanum** *species)*

One of these plants is the garden egg, often known as eggplant. It has approximately 100 species throughout Africa, most of which are utilized as vegetables, with 25 species identified in Nigeria. *Solanum aethiopicum* (green-striped round shaped garden egg) and Solanum macrocarpon (white-green striped oval garden egg) are the most commonly distributed and are eaten raw, cooked, or fried to prepare vegetable sauce (Ogwu et al. 2016c). Additionally, different portions of *S. Melongena* can be used to treat inflammatory diseases, cardiac debility, neuralgia, nasal ulcers, cholera, bronchitis, and asthma. Because of its flavour and increased proportion of vitamin B2, the fruit is a very important vegetable all over the world. The fruit can also be used to treat diabetes (Ogidi et al. 2021c).

12.3.8 **Artemisia herba-alba**—*White Word or Wormwood*

Asso (Mediterranean) Wormwood or desert wormwood is the common name for Artemisia herba-alba (known in Arabic as shih, and as Armoise blanche in French). It is a perennial dwarf shrub native to Northern Africa, the Arabian Peninsula, and Western Asia that is greyish and scented (Segal et al. 1987). Many civilizations have employed *A. herba-alba* in folk medicine since prehistoric times. It is used to treat arterial hypertension and diabetes in Moroccan folk medicine, and diabetes, bronchitis, diarrhoea, hypertension, and neuralgias in Tunisian traditional medicine (Ziyyat et al. 1997).

Herbal tea from A. herba-alba has been used in traditional medicine as an analgesic, antimicrobial, antispasmodic, and hemostatic agent (Zeggwagh et al. 2008; Laid et al. 2008; Tahraoui et al. 2007; Friedman et al. 1986). During an ethnopharmacological investigation among the Bedouins of the Negev desert, *A. herba-alba* was discovered to be used to treat stomach problems. This plant is also thought to be useful as a source of fodder for sheep and animals in Algeria's plateau regions, where it grows abundantly. It has also been reported that the oil of the Libyan *A. herba-alba* killed Ascaridae from pigs and ground worms in a short period of time (Mohamed et al. 2010; Benmansur et al. 1990; Fenardji et al. 1974). The antifungal activity of the constituents and biological activities of *Artemisia herba-alba* essential oils of 25 Moroccan medicinal plants, including *A. herba-alba*, were reported in another study against *Penicillium digitatum*, *Phytophthora citrophthora*, *Geotrichum citri-aurantii*, and *Botrytis cinerea* (Belhattab et al. 2012; Mohamed et al. 2010).

*12.3.9 Onion (*Allium cepa*)*

Onions have long been a staple of many civilizations' diets and have long been prized for their medical properties. Onions are monocotyledons of the Liliaceae family. The onion is one of the most widely grown vegetables in the world, and it is said to have originated in Central and Western Asia. Onions were widely consumed throughout Europe throughout the Middle Ages, and their pungent stench was subsequently supposed to protect against bad spirits and the plague. The vegetable has been linked to a variety of health advantages, including cancer prevention and cardiovascular disease prevention. Following this, research was conducted on particular chemicals discovered in onion bulbs. Onions have a unique blend of three chemical families that are thought to have health-promoting properties. They include fructans, which are tiny carbohydrate molecules that support gut health by supporting good microorganisms. Flavonoids operate as antioxidants and deactivate chemicals that are harmful to the body's cells. As well as organosulphur chemicals, which are chiefly responsible for onions' flavour and odour. These chemicals minimize diabetes mellitus symptoms, limit platelet aggregation (which causes thrombosis), and prevent asthmatic inflammatory processes (Ogidi and Julius 2021).

*12.3.10 Rooibos (*Aspalathus linearis*)*

The well-known herbal tea, also known as rooibos, is made from Aspalathus linearis, a native South African fynbos plant. Its caffeine-free and low tannin content, as well as its putative health-promoting characteristics, most notably antioxidant activity, have all led to its widespread acceptance and appeal. The use of rooibos has expanded beyond herbal tea to include intermediate value-added goods such extracts for the beverage, food, nutraceuticals, and cosmetics industries (Joubert and de Beer 2011; Marnewick et al. 2009; Van Heerden et al. 2003).

Rooibos has been utilized in a variety of ways across Africa for centuries. It's been utilized as a cooling beverage and a nutritious tea beverage (Brendler et al. 2010; Gurib-Fakim et al. 2010). Only when she discovered that giving her colicky infant a rooibos infusion relieved her child's persistent restlessness, vomiting, and stomach pains did rooibos become generally known as a "healthy" beverage, resulting in a larger user base. Since then, rooibos has been used to nourish many newborns, either in their milk or as a weak drink (Kreuz et al. 2008; Gilani et al. 2006; Khan and Gilani 2006; Van Wyk and Verdoorn 1989).

12.3.11 Vernonia amygdalina *(Bitter Leaf)*

The leaf has been utilized as an antidiabetic, antimalarial, antisickling, antioxidant, and other medicinal properties. Saponins, alkaloids, sterol-terpenes, and phenolic acids were observed to be present (Ogidi et al. 2019d; Izah et al. 2018a).

12.3.12 Centella *Species*

Centella species has been utilized as a medicinal herb from prehistoric times. It is employed in many healing cultures, including Ayurvedic medicine, Chinese traditional medicine, Kampo (Japanese traditional medicine), and African traditional medicine, and has a pan-tropical distribution (Brendler et al. 2010; Brinkhaus et al. 2000). To this day, it is being utilized in folk medicine, and it is increasingly being found at the intersection of traditional and modern scientifically oriented medicine.

C. asiatica has traditionally been used to treat wounds, ulcers, leprosy, tuberculosis, lupus, skin disorders, eye illnesses, fever, inflammation, asthma, hypertension, rheumatism, syphilis, epilepsy, diarrhoea, and mental illness, as well as being eaten as a vegetable or used as a spice. The use of *C. asiatica* in the treatment of leprosy was first described in Mauritius in 1852, and its clinical usage as a therapeutic agent suited for the treatment of leprous lesions has been documented since 1887. (Brendler et al. 2010).

Clinical effects in the treatment of chronic venous illness, wound healing, and cognitive functioning, among other things, describe the active ingredients (Brendler et al. 2010). *C. asiatica* includes many pentacyclic triterpenoids that have been investigated extensively. The two most major active chemicals employed in medication formulations are asiaticoside and madecassoside. Based on their anti-inflammatory properties, both are commercially employed primarily as wound-healing agents. The ursane-type triterpene saponin asiaticoside, which is responsible for wound healing activities (Kim et al. 2009; Shukla et al. 1999) and is known to induce type 1 collagen production in fibroblast cells, is one of the key active ingredients of *C. asiatica* (Lee et al. 2006).

*12.3.13 Black Eye Beans/Cowpea (***Vigna unguiculata***)*

In most African cultures, the plant's seed is a staple diet. It also contains saponins, which reduce carbs, lipids, and oil, as well as steroids, glycosides, and alkaloids, and is utilized in antisickling recipes (Kunle and Egharevba 2013).

*12.3.14 Clove (***Eugenia caryophyllata***)*

In sickle cell disease, the fruit, leaf, and stalk are employed. Antimicrobial, antioxidant, antifungal, and antiviral activities are present in the plant, as well as anti-inflammatory, cytotoxic, insect repellent, and anaesthetic effects. The plant had been found to produce essential oils high in eugenol, eugenyl acetate, -caryophyllene, gallotannic acid, and other compounds (Kunle and Egharevba 2013).

12.3.15 **Catharanthus roseus** *(Madagascan Periwinkle)*

Catharanthus roseus is a well-known medicinal plant with its origins in Africa. The medicinal value of this species stems from the fact that it is the sole source of the anticancer alkaloids vincristine and vinblastine, which are difficult to produce in the laboratory due to their complexity; the leaves of this species are still the only source of these alkaloids today (Pereira et al. 2010; Brendler et al. 2010). *C. roseus* is native to Madagascar, although it currently has a broad distribution across the tropics. Its traditional use may be traced back to Madagascar, where healers have used it extensively to cure a variety of diseases. It's often used as a bitter tonic, galactogogue, and emetic in traditional medicine. Rheumatism, skin ailments, and venereal infections have all been claimed to be treated with it (Gurib-Fakim et al. 2010; Abegaz et al. 2004).

The main component of *C. roseus* is vindoline, which contains a variety of phytochemicals (as many as 130 components) (up to 0.5 percent). Serpentine, catharanthine, ajmalicine (raubasine), akuammine, lochnerine, lochnericine, and tetrahydroalstonine are some of the other physiologically active chemicals. Bisindole alkaloids are abundant in the plant; vindoline and catharanthine are detected in trace amounts: vincristine (leurocristine) in up to 3 g/t of dry medicine and vinblastine (vincaleucoblastine) in slightly more (Pereira et al. 2009; Ferreres et al. 2008; Van der Heijden et al. 2004; Gurib-Fakim et al. 2010).

12.3.16 African (White) Star Apple (**Chrysophyllum albidum***)*

In most African societies, the fruit is eaten as a snack and a vegetable. Eleagnine, found in the seed, has antioxidant, anti-inflammatory, and antibacterial properties. The seed is used as an antidiarrheal, among other things (Egharevba et al. 2015).

12.3.17 **Cyclopia genistoides** *(Honeybush)*

Cyclopia genistoides is a South African herbal tea that is considered a health food. To make tea, the green shoots and blossoms were traditionally fermented and dried. It has also been appreciated as a stomachic that supports poor digestion without harming the heart since ancient times for its direct favourable benefits on the urinary system. It is mostly used as a tea alternative because of the absence of hazardous chemicals such as caffeine. It's one of the few indigenous South African plants to have successfully transitioned from the wild to a commercial commodity in the last century. Over the last two decades, research has focused on propagation, production, genetic enhancement, processing, composition, and the possibility for value addition (Joubert and de Beer 2011; Brendler et al. 2010).

Honeybush decoction was employed as a restorative and expectorant in the treatment of chronic catarrh and pulmonary TB (Bowie 1830). Drinking a honeybush infusion supposedly enhances hunger as well, but no specific species is mentioned (Watt and Breyer-Brandwijk 1962). Many colonists hailed honeybush as nutritious, valuing it as a stomachic that supports poor digestion without creating any severe stimulating effects on the heart, according to Marloth 1925. It also helps with nausea and heartburn (Van Wyk et al. 2009; Van Wyk 2008; VanWyk and Smith 2004, 1996). It boosts milk production in breast-feeding mothers and cures colic in newborns, according to anecdotal data (Rood 1994).

12.3.18 **Harpagophytum procumbens** *(Grapple plant)*

Harpagophytum procumbens is found in red sand regions of South Africa's Transvaal, Botswana, and Namibia. It's now found all throughout the Kalahari and Savannah deserts. For years, if not millennia, the indigenous San and Khoi people of Southern Africa have utilized Devil's Claw medicinally (Andersen et al. 2004).

Harpagophytum procumbens has a long history of indigenous applications and is one among Africa's most marketed indigenous traditional medicines, with bulk exports mostly to Europe, where it is converted into a variety of health products including teas, pills, capsules, topical gels, and patches (Mncwangi et al. 2012).

Traditional uses include allergies, analgesia, anorexia, antiarrhythmic, antidiabetic, antiphlogistic, antipyretic, appetite stimulant, arteriosclerosis, bitter tonic, blood diseases, boils (topical), childbirth difficulties, choleretic, diuretic, climacteric (change of life) problems, dysmenorrhea, dyspepsia, edema, fever, and fibromyalgia., Devil's claw is used as an anti-inflammatory and analgesic in the treatment of joint ailments, back discomfort, and headaches. The widespread use of standardized Devil's claw as a moderate analgesic for joint pain in Europe is based on evidence from scientific investigations in animals and people (Mncwangi et al. 2012; Andersen et al. 2004; Chrubasik and Bradley 2004; Wegener and Lupke 2003; Ernst and Chrubasik 2000).

12.3.19 Momordica charantia *(Bitter Melon)*

Momordica charantia is a tropical vegetable produced throughout Africa. The juice derived from the various plant components (fruit pulp, seeds, leaves, and whole plant) is a fairly widespread folkloric cure for diabetes. M. charantia has a long history of usage as a folkloric hypoglycemic medication, with the plant extract dubbed "vegetable insulin" (Ahmad et al. 1999).

M. charantia has yielded a number of active chemicals, as well as some mechanistic research (Mahomoodally et al. 2004; Matsuura et al. 2002; Matsuda et al. 1998; Kimura et al. 1991). Khanna et al. (1981) isolated "polypeptidep," a 17-amino acid, 166-residue polypeptide that did not cross-react in an immunoassay for bovine insulin, from fruits, seeds, and tissue culture of seedlings. The antilipolytic and lipogenic effects of a galactose binding lectin isolated from the seeds of M. charantia were tested in isolated rat adipocytes and found to be equivalent to insulin (Dubey et al. 1987; Akhtar et al. 1981). In diverse animal models, extracts of M. charantia fruit pulp, seed, leaves, and entire plant showed hypoglycemic effects (Dubey et al. 1987; Akhtar et al. 1981). When the bitter melon fruit juice was given orally to rats, Karunanayake et al. (1984) discovered a considerable improvement in glucose tolerance and hyperglycemia. Eight Evidence-Based Complementary and Alternative Medicine In normal rats and noninsulin dependent diabetics (NIDDM), both fresh and freeze-dried M. charantia, greatly improved glucose tolerance (Jayasooriya et al. 2000; Yesilada et al. 1999). M. charantia fruit is thought to have more than one type of hypoglycemic component. An active principle known as "charantin," a homogeneous combination of -sitosterol-glucoside and 2-5-stigmatadien-3—olglucoside that may cause hypoglycemia in normal rabbits, could be one of them (Raman and Lau 1996).

*12.3.20 Laggera (*Laggera pterodonta*)*

Taba-taba (Hausa) and Taba-ebora are two more names for the same plant (Yoruba). Anti-inflammatory, antiviral, antibacterial, anti-tubercular, and hepatoprotective activities are found in the aerial component. Essential oils, sesquiterpenoids, and triterpenoids, among other things, are present (Egharevba et al. 2010b).

12.3.21 **Pelargonium sidoides** *(South African Geranium)*

Pelargonium sidoides is a tuberous plant endemic to South Africa's coastal areas, and existing ethnobotanical data indicate that it is an important traditional medicine with a long ethnobotanical history (Brendler et al. 2010). *P. sidoides* root extract EPs 7630 is a herbal medicine that is supposed to help with acute respiratory infections. *P. sidoides* and respiratory tract infections have been studied extensively (Agbabiaka et al. 2008; Timmer et al. 2008). These investigations suggested that *P. sidoides* might help adults with acute rhinosinusitis and the common cold, although there is still some scepticism. It may help relieve the symptoms of acute bronchitis in both adults and children, as well as sinusitis in adults (Timmer et al. 2008). By day 7, EPs 7630 has lowered bronchitis symptom ratings in patients with acute bronchitis (Agbabiaka et al. 2008). There were no major side effects noted. EPs 7630 has a beneficial effect on phagocytosis, oxidative burst, and intracellular cell death (Conrad et al. 2008; Conrad and Frank 2008; Conrad et al. 2007). The synthesis of secretory immunoglobulin A in saliva, both interleukin-15 and interleukin-6 in serum, and interleukin-15 in the nasal mucosa is all modulated by *P. sidoides* extract (Brendler and Van Wyk 2008).

*12.3.22 Pawpaw (*Carica papaya*)*

The fruit and leaves of the pawpaw (*Carica papaya* L) are edible and frequently used as vegetables. Tea produced from papaya leaves is used to treat malaria and enhance platelet counts in the blood. The alkaloid papain was extracted from the plant (Izah et al. 2018b; Kunle and Egharevba 2013).

12.3.23 **Agathosma betulina** *(Buchu)*

Agathosma betulina is a woody plant with the botanical name *Agathosma betulina* (Berg.) pillans (Van Wyk et al. 1997). It's only found in the Western Cape Cederburg region of South Africa, where it's suited to arid circumstances and grows on sunny rocky-sandstone slopes (Golblatt and Manning 2000). Buchu is a significant plant in the Khoi-San tradition (VanWyk and Gericke 2000), and it has a long history of use as a general health tonic, diuretic, and mild urinary antiseptic (Van Wyk et al. 1997). The antispasmodic, antibacterial, and diuretic properties of the essential oil are most likely due to this ingredient (Lis-Balchin et al. 2001; Wichtl and Bisset 2000). Antispasmodic, antipyretic, liniment, cough cure, cold and flu remedy, diuretic, treatment of kidney and urinary tract infections, haematuria, prostatitis, cholera, stomach illnesses, rheumatism, gout, bruising, calculus, and antiseptic are some of the medical applications of *A. betulina* (Simpson 1998; Watt and Breyer-Brandwijk 1962). Buchu tinctures have a long history of usage as general health tonics, stomach pains therapy, aromatic bitters, diuretics, and mild urinary antiseptics (VanWyk and Gericke 2000). To keep their skin supple and wet in the arid atmosphere, the San oiled their bodies with scented herbs combined with fat. The lubricant also worked as an antibacterial and antifungal protectant, an insect repellent, a deodorant, and a way to enhance overall bodily well-being by allowing fragrant chemicals to be absorbed via the skin (Van Wyk et al. 1997).

Buchu's composition has been thoroughly investigated, and various chemicals have been found. The compounds found in *A. betulina* were mostly concentrated in the plant's volatile fractions and included limonene, menthone, diosphenol, and l-pulegone (Fluck et al. 1961), with isomenthone and diosphenol as the major volatile compounds (Posthumus et al. 1996; Kaiser et al. 1975), which are responsible for the distinctive flavour as well as antispasmodic and antiseptic (Van Wyk 2011). The economically relevant sulphur-containing compounds (cis and trans-8-mercapto-p-methan-3-one) are a hallmark of *A. betulina*, and despite their minor levels, they are responsible for the oil's distinctive organoleptic qualities (Sandasi et al. 2010).

*12.3.24 Cocao (*Theobroma cacao*)*

The fruit and seed of the cocao tree are processed into beverages and consumed. The stem bark is utilized as an antisickling, antioxidant, and other medicinal properties. Saponins, polyphenolics, catechins, and anthocyanins were discovered in the plant (Kunle and Egharevba 2013).

*12.3.25 Neem (*Azadirachta indica*)*

Neem is a versatile medicinal plant that contains a variety of compounds with varying chemical structures and biological effects. Steroids, glycosides, alkaloids, and tannins are some of the active phytoconstituents found in neem. Neem leaves effectively treat eczema, ringworm, acne, antihyperglycemic properties, and anti-inflammation. It aids in the purification of our blood and the neutralization of free radicals. Neem leaves have anticancer properties. Neem seed extract has been shown to have a wide range of pharmacological properties, including antioxidant, antimalarial, antimutagenic, anticarcinogenic, and anti-inflammatory properties. The presence of several bioactive chemicals in various areas of the plant is credited with the biological activity. Antifungal, antiviral, anti-inflammatory, antibacterial, analgesic, and antioxidant are just a few of the therapeutic properties of neem. Every part of the neem tree is bitter, and it has a wide range of uses (Ogidi et al. 2021d).

*12.3.26 Guayava (***Psidium guajava***)*

The fruit of the guayava tree (*Psidium guajava* Linn) is edible and widely consumed. Fever, malaria, gastroenteritis, vomiting, diarrhoea, dysentery, wounds, ulcers, toothaches, coughs, and other conditions are treated with the leaf, fruit, and stem bark. Saponins, tannins, flavonoids, and glycosides were reported to be present in the plant (Egharevba et al. 2010a).

12.4 Current Trends in the Use of Medicinal Plants

With civilization, improved awareness, and the availability of more research data, the use of medicinal plants for foods, infrastructure development, and raw materials for industries (e.g. agro, chemical, textile, pharmaceutical, etc.) appears to be on the rise. Also, there is need for rebranding which can begin with improved packaging of these medicinal plant products and creating a conducive environment for their product development, market, and sale as well as understanding their long-term use implications (Ogwu 2019b, 2020; Evivie et al. 2020). More studies are being conducted in the fields of gene manipulation for increased yield and bio-production, herbal remedies, and as a source of leads/hits for the development of novel pharmaceuticals. Though the overall pattern of use stays mostly same, there appears to be a shift in the relational quantum in distinct use-schemes or regions in different parts of the world, depending on their degree of civilization. However, as shown in the Fig. 12.1, the present trend seems to serve several good purposes:

Awareness**:** Public awareness of medicinal plants' health and economic potential is growing, and individuals in certain nations and communities are already taking use of the prospects.

Economic Benefits: As people become more aware of herbal products and resources, more people are investing in preservation and conservation practises for some economically important crops and plants used in medicine, such as bitter leaf plantations, guayava plantations, cashew plantations, and so on.

Research: More study is currently being done on the development of medicinal plants as a commercial commodity, which will lead to standardization, safety, and evidence of efficacy, product stability and preservation, and improved storage,

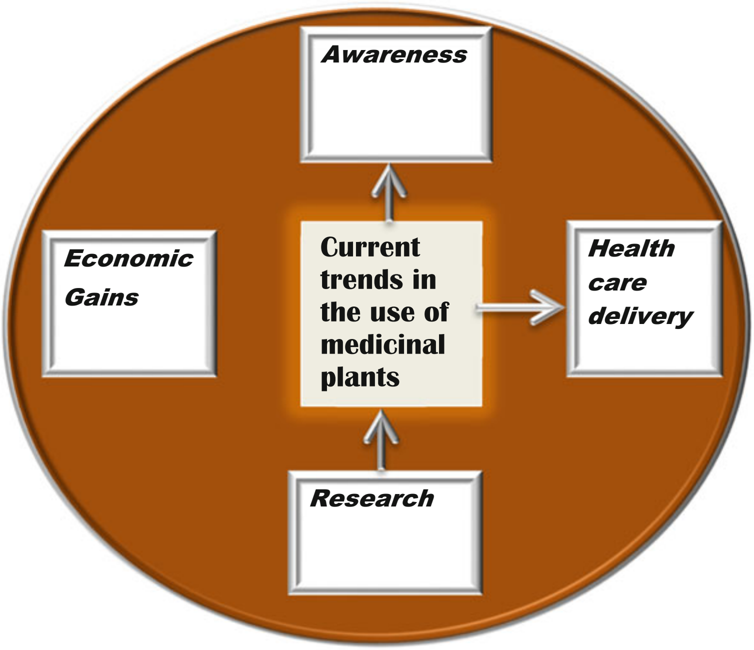

Fig. 12.1 Chart on the current trends in the use of medicinal plants

handling, and procedures (GLP, GMP, GAP). Many laboratories are also working on transforming wild species into cultivated ones for propagation.

Health-care idelivery: Scientific evidence of the usefulness of some of these plants has aided in universal acceptance, especially among the learned, and has allowed some herbal remedies to be placed on essential drug lists in several countries to support healthcare delivery. It has also backed the possibility and worldwide drive for improved integration of herbal medicine into many countries' healthcare delivery systems.

12.5 Sustainable Exploitation of Medicinal Plant Resources in Africa

The realization that humans are an intrinsic element of ecosystems is at the heart of the ecosystem approach to sustainability. As a result, one is reliant on the other. A civilization can be considered sustainable if it uses resources in such a way that both the human and ecosystem conditions remain steady or improve. Four interconnected measures must be considered when developing a sustainable harvest strategy: (1) the environment, (2) communities and ecosystems, (3) plant populations, and (4) genetic diversity (Schippmann et al. 2002b).

There is a link between resource supply, population number, and sustainable harvesting rates for every plant resource. Low stocks result in low yields, especially if the plant is slow-growing and has a low reproduction rate (Cunningham 1997). The plant's life after harvesting is determined by the plant components collected. The plant dies when bark, roots, or complete plants are taken. Leaf, flower, fruit, and seed harvesting are regarded less harmful; however, extreme pruning reduces a plant's vitality and reproductive capacity (Van Andel and Havinga 2008; Grace et al. 2002). Sustainable harvesting rates are determined by the vegetation type from which the plants or plant parts are harvested, as well as their quantity and growth rates. In general, how much can be utilized sustainably depends on the rate of regeneration following harvesting (Delveaux et al. 2009).

Plant part harvesting tolerance varies depending on environmental circumstances and the resources available to support growth and recovery (Ticktin 2004). Because research on the conservation and sustainable use of medicinal plants and their habitats has lagged far behind demand for this globally important resource, information on how much plant material constitutes sustainable harvesting is completely lacking for many countries and many plant species (Van Andel and Havinga 2008). Nonetheless, the present threats facing these resources will not go away and need the development of specific sustainable conservation and utilization programs (Ogwu et al. 2014; Osawaru and Ogwu 2014). Each species has its own ecological, socioeconomic, health, and cultural relationships, which must be understood (Schippmann et al. 2002b). According to Vermeulen (2009), controlled, experimental harvesting, and long-term monitoring are the only ways to establish yield systems and best practises for harvesting.

In the early 2000s, South Africa extracted around 20,000 tons of plant materials from wild resources each year for the local medicinal plant trade market (Mander et al. 2007). These figures do not include quantities harvested for export. In Nigeria, medinical plant species are commonly found in local rural and sub-urban markets (Osawaru and Ogwu 2020). Only 5 tons of cultivated plants are gathered, while another 40 tons of rare species are imported from neighbouring countries such as Mozambique and Swaziland (Mander et al. 2007; Mander 1998). Depending on demand and availability, annual amounts gathered for the local medicinal plant trade market may fluctuate somewhat. According to Mander et al. (2007), the following percentages of plant parts are traded in South Africa: 27% roots, 27% bark, 14 percent bulbs, 13 percent complete plants, 10% leaves and stems, 6% tubers, and 3% mixes of plant parts. Several authors have claimed that South Africa's harvesting rates are unsustainable (Van Andel and Havinga 2008; Kambizi and Afolayan 2006; Botha et al. 2004; Mander 1998), and Botha et al. (2004) have claimed that increased habitat pressure has resulted in numerous local extinctions. Due to a paucity of recent research and information, it is possible that the situation has worsened dramatically since 2007 and prior reports, emphasizing the significance of an integrated regulatory structure.

Maundu et al. (2006), Strydom and King (2013), Regassa (2013), and Cunningham (1997) identify the following as causes of unsustainable harvesting in general: (1) A high rate of global population growth, (2) competing land uses,

(3) environmental degradation, (4) loss of indigenous knowledge, (5) increasing commercialization of traditional medicine, (6) increasing demand in local and international markets, (7) lack of appropriate policies and legislation and/or failure to enforce them, (8) poverty and high unemployment (9) low medicinal plant prices, (10) invasive alien plants that threaten indigenous plant diversity, (11) unsustainable harvesting methods, (12) undue pressure on specific preferred species, and (13) slow plant growth, particularly in medicinal tree species. Unsustainable harvesting has three major consequences, according to Maundu et al. (2006): (1) local or global extinctions, (2) genetic pool shrinkage, and (3) weakened regeneration ability.

With rapidly declining medicinal plant populations, an explosive increase in the human population, and the remaining medicinal plant populations, particularly plants with roots and bulbs, and slow-growing, slow-reproducing medicinal tree populations already overexploited by injudicious harvesting, it is possible to speculate whether harvesting from the remnant medicinal plant populations, even if sustainable harvesting methods are used, could be sustainable.

12.6 Factors Related to Species Rarity of Medicinal Plants

Prior to beginning conservation efforts, species rarity is used to assess the extinction risk of medicinal plants and to identify those species that are most at risk of extinction (Figueiredo and Grelle 2009). It's crucial to figure out how uncommon each species is, as well as how rare species differ from one another. Harvesting pressures affect not all medicinal plants in the same way (Wagh and Jain 2013; Van Andel and Havinga 2008). Overexploitation, indiscriminate collection, uncontrolled deforestation, and habitat degradation all have an impact on species rarity, but they are inadequate to explain individual species sensitivity to harvest pressure. Habitat specificity, distribution range, population size, species diversity, growth rate, and reproductive system are all biological characteristics that are linked to extinction risk.

12.7 Cultivation of African Medicinal Plant Species

With the growing recognition that wild medicinal plant populations are being overharvested, several organizations, including the World Health Organization (WHO), the International Union for Conservation of Nature (IUCN), and the World Wide Fund (WWF), have recommended that wild species be introduced into cultivation systems (Schippmann et al. 2002a). Since Gerstner's suggestion in 1938, large-scale production of medical plant material for the medicinal plant trade has not been attempted due to a number of problems (Cunningham 1988). Because of the joint responsibilities between national and provincial governments, enforcing environmental regulations in Africa is difficult. As a result, implementation has become fragmented. The government's willingness and ability to take action against those who do not follow the law also limits the implementation of conservation laws (Strydom and King 2013). The lack of cultivation of medicinal plant species in Africa is due to three main factors: (1) a lack of institutional support for the production and dissemination of key species for cultivation, (2) low prices paid to plant material harvesters by herbal traders, and (3) many important medicinal species take a long time to mature (Cunningham 1997). Plants must be cultivated cheaply and in large quantities if medicinal plant material is to be successful in providing an alternative supply in herbal medicines and reducing harvesting pressure on wild stocks. Cultivation will only mask the continued exploitation of wild resources, it was stated in the 1990s, if it does not take place on a scale large enough to meet annual market demand (Cunningham 1997). Demand, plant size, and plant growth rate all influence the amount of land required for cultivation. Bulbous plants, for example, can be planted densely and rotated every six to ten years, resulting in a tiny rotational area, but trees require considerably greater land area for good root growth and development. Their rotating area would consequently be far larger, especially when the slow-growing characteristic of Africa's native trees is considered (Cunningham 1988).

Many people in rural areas think that metaphysical threats are threatening the healing ability of amayeza (isiXhosa for medicine), and this concept has ramifications for the adoption of farmed medicinal plant material. They claim that when amayeza gets in contact with "polluted humans," it loses its potency (Wiersum et al. 2006). For environmentalists, acceptance of grown medical plants is a constant source of concern, as farmed material is thought to lack the (spiritual) 'power' of healing (Cunningham 1993). Although cultivated medicinal plant material is accepted as an alternative in countries such as Swaziland, Botswana, and Ghana, conservative traditional health practitioners in most of Africa, particularly South Africa, believe that plants grown in western ways (i.e. with fertilizers and in straight rows) will not have the same healing properties as plants harvested from wild populations (Fennel et al. 2004). Factors such as season, irrigation, and fertilization of material have resulted in changed medicinal activity of grown material, which has previously been stated in this statement (Prinsloo and Nogemane 2018).

Because natural populations are older due to sluggish development, bioactive chemicals in fast developing produced stock may be lower than bioactive compounds in wild populations (Schippmann et al. 2002a). People's ideas about the cultural applications of medical plants and plant parts, on the other hand, were shown to be more essential than their concerns about the potency of cultivated plants. As a result, demand for cultivated medicinal herbs has increased (Wiersum et al. 2006).

Planting amayeza species in a separate and secluded area of a home garden, on the other hand, was seen as a reasonable option for limiting the chance of coming into touch with contaminated persons. Wiersum et al. (2006) found that the majority of those polled said they would utilize farmed material for healing or protection. Lack of water for irrigation and challenges with propagation and a lack of knowledge with suitable culture needs such as soil and light conditions, are all obstacles to home garden cultivation (Wiersum et al. 2006).

Cultivation has a variety of market benefits over wild stocks when it comes to the manufacture of plant-based medicines (Schippmann et al. 2002a). The benefits include: (1) material collected from the wild and sold in street markets is frequently adulterated with unwanted, harmful plant species to enhance potency, whereas cultivated material provides reliable botanical identification, (2) provide a steady source of raw material, (3) wholesalers and pharmaceutical companies can agree on volumes and prices with the grower, (4) controlled post-harvest handling and thus appropriate quality control, and (5) standards can be adjusted to regu (Rates 2001).

Some species may be difficult to cultivate owing to biological characteristics or ecological needs, such as sluggish growth rates, soil and water requirements, poor germination rates, and insect vulnerability (Rao et al. 2004; Schippmann et al. 2002b). Economic feasibility is the primary motivation for cultivation, but it is also a restriction. Commercial harvesters gathering material from wild populations have no input costs, therefore cultivated stock will compete with stocks obtained from wild populations at trade markets. Only a few species could be offered at high enough prices to make cultivation economical due to low pricing et al (Schippmann et al. 2002a). Cultivation for profit is thus limited to a small number of high-priced and/or fast-growing species with a specific commercial market in mind. There is ongoing competition from inexpensive plant material collected in the wild with little or no cost to the gatherers. Despite the fact that several species, such as Siphonochilus aethiopicus and Warburgia salutaris (pepper bark tree), have become extinct or vulnerable in the wild (Botha et al. 2004), low prices mean that only a few slow-growing species are grown (Cunningham 1993). Siphonochilus aethiopicus, a plant with rhizomatous roots, is easy to propagate and cultivate, and it is effectively cultivated in South Africa's warm regions (Van Wyk 2008).

Cultivation may assist certain medicinal plant material producers in rural communities by allowing them to earn money, as both men and women are equally involved (Wiersum et al. 2006). If cultivation increases to the point that foreigners with cash come in and construct large-scale monocultural plantations for export markets, rural people may only gain from plantations as a consequence of accessible employment and hence off-farm income. Large medicinal plant farms developed by wealthy and powerful individuals may manipulate market dynamics to their benefit by enforcing low salaries, limiting the social and economic growth of local people. The country's elite and the national economy will be the primary benefactors of large-scale exports (Schippmann et al. 2002a). According to Schippmann et al. (2002a), those socially disadvantaged populations that rely on traditional medicine for survival and monetary income may not have access to agricultural land and hence are unable to compete with large-scale medicinal plant production by well-established farmers.

Cultivation is a conservation alternative for vulnerable medicinal plant species because the yearly sustained production is substantially larger than the continual gathering of material from wild populations. The impact on wild populations will be lessened if demand for these species can be fulfilled from farmed sources. However, it will not boost genetic diversity. As a result, stringent protection of surviving wild populations, better ex situ security of germ cell genetic material, and investment in selection and development programmes are all critical (Schippmann et al. 2002a).

12.8 Some Challenges Associated with the Utilization of African Medicinal Plant Resources

Uncontrolled exploitation and depletion of species, particularly endangered species, is a key concern of expanding medical plant use, leading to unsustainable methods and effects. The following are the reasons behind this challenge:

- Poverty – synonymous with use of forest resources for energy, food and shelter, etc.
- Unregulated mode of use/practice (absence of protocols and SOPs)
- Level of education of practitioners
- Cultural beliefs and unsustainable land use policy
- Species displacement in cultivation or farming
- Indiscriminate collection, bad harvest, and agricultural practice
- Lack of standardization, which could have helped in determining the direction and quantum of use through monitoring and documentation.
- Environmental factors (fire, anthropologic activities, etc.)
- Inadequate or lack of plan and action for conservation and preservation.
- Absence of large-scale cultivation and lack of strategic plan to meet future demands.
- Inadequate R&D information needed to erase or modify perception, improve standardization, documentation, good agricultural practice (GAP), good manufacturing practice (GMP), and eradicate bad or unsustainable practices.

12.9 Prospects and Potentials of African Medicinal Plant Resources

Advances in tissue culture and fermentation of medicinal plants have opened new possibilities for the large-scale and highly efficient manufacture of desired bioactive chemicals, while advances in genetic engineering have made large-scale biosynthesis of natural products feasible. Tissue culture (which includes plant cell and transgenic hairy root culture) is a viable option for producing uncommon and high-value secondary metabolites with medicinal significance (Rao and Ravishankar 2002). Micropropagation through tissue encapsulation of propagules not only makes storage and transit easier, but it also boosts regeneration rates (Baker et al. 2007). Synthetic seed technology, defined as artificially encapsulated somatic embryos (or other tissues) that can be cultivated in vitro or ex vitro, is a viable option when regular seeds are insufficient for propagation (Lata et al. 2008; Zych et al. 2005). Furthermore, utilizing molecular marker-based methodologies used at the genetic level, breeding enhancements may be made and breeding time can be greatly reduced (Lata et al. 2008; Rao and Ravishankar 2002).

12.10 Conclusion

Thousands of plant species thrive in Africa, each producing distinct and important chemical compounds, with medicinal plants still the continent's most plentiful resource. More practical information on medicinal plants, on the other hand, would increase their value in agricultural landscapes by assisting farmers in improving their livelihoods while also ensuring environmental sustainability. A large percentage of Africans rely on these plants for primary health care, but rising population, increased competition for land, and unsustainable exploitation/use as an industrial raw material and for food are threatening the medicinal plants' survival for future generations. As a result, advocates and practitioners must promote and practise sustainable utilization, conservation, and exploitation of plant resources and biodiversity.

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