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The Multifaceted Value of Herbs and Spices: Enhancing Health, Food Quality, and Economic Viability

Ahmed Tawakalitu*, Onyegbula Akudo Francilia**, Lawal Israel Oluwasanmi***, Adole Ekedegwa Benedict****, Oyeyipo Stephen Olufemi*****, Adediran Blessing Iyanuoluwa******, Ariyo Damilola Olubunmi*******

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ABSTRACT

Herbs and spices have long been valued for their culinary and medicinal properties, transitioning from humble, low-cost plant parts to highly prized commodities such as gold and jewels. This paper varied the roles of herbs and spices in various application. A systematic approach was adopted for this review paper. The herbs and spices play a crucial role in enhancing the sensory attributes of food, prolonging the shelf life of food, and offering health benefits through their bio-active compounds, which can help reduce the risk of degenerative diseases such as diabetes, obesity, cancer, and cardiovascular conditions. In Nigeria's biodiversity-rich context, herbs and spices are essential both as food enhancers, raw materials for the pharmaceuticals and cosmetics industry with value-added products ensuring year-round availability and economic viability. Additionally, the residual matter of spices, rich in dietary fibers and nutrients, offers further industrial applications, highlighting the necessity for sustainable practices to fully unlock their potential. This study emphasizes the importance of herbs and spices in promoting health, improving food quality, and supporting economic development.

1. Introduction

Herbs and spices were mostly believed to be low-cost commodities obtained from plant parts such as bark, flowers, roots, seeds, nuts, and fruits. These substances have been esteemed for centuries, comparable to gold or jewels, due to their significant roles in food preservation, flavour enhancement, and therapeutic applications. Historically, their use has contributed to the acceptability of food and has played a crucial part in improving human health (El-Sayed *et al.,* 2019). The earliest recorded evidence of the use of herbs and spices for culinary and medicinal purposes started around 1500BC, as documented in the Ebers Papyrus. This ancient text references various spices, including anise, mustard, saffron, cinnamon, and cassia, highlighting their significance in early medicine (Leja and Czaczyk, 2016). In the 21st century, a diverse array of secondary compounds derived from plants is employed across multiple industries. In the realm of food production, these compounds not only enhance flavour but also provide essential vitamins and minerals while inhibiting spoilage from foodborne bacteria. In the field of medicine, they are integral to the treatment of various diseases, playing significant roles in chemoprevention and cancer therapy, and serving as sources of natural antimicrobials to combat infectious diseases. Furthermore, within pharmacology and cosmetology, these compounds are increasingly incorporated into dietary supplements and sought after in the development of preservative-free cosmetic products, thereby mitigating the risk of allergies associated with methylparaben (Leja and Czaczyk, 2016).

*, **, ***, ****, *****, ******, ******* Perishable Crops Research Department, Nigerian Stored Products Research Institute (NSPRI) Ilorin, Kwara State, Nigeria. Email addresses: ahmedtawakalitu71@gmail.com (Corresponding author – A. Tawakalitu), onyegbulakudo@gmail.com (O. A. Francilia), lawalisrael07@gmail.com (L. I. Oluwasanmi), adoleeb@nspri.gov.ng (A. E. Benedict), oyeyiposo@nspri.gov.ng (O. S. Olufemi), adediranblessingiyanu@gmail.com (A. B. Iyanuoluwa), adamilolamary78@gmail.com (A. D. Olubunmi).

Spices and herbs are used to enhance food's sensory properties in food industries (Tapsell *et al*., 2006) and serve as an essential raw material for pharmaceutical and cosmetic industries. This is because they contain an abundant number of bioactive compounds that are responsible for medicinal and anti-oxidative properties which help to alter the shelf life of foods by reducing the oxidation reactions and also act as an anti-ageing agent which reduces the risk of non-communicable diseases by those that consume it (Tapsell *et al.,* 2006). Bioactive compounds derived from spices and herbs possess the potential to inhibit or decrease the risk of degenerative diseases, such as diabetes, obesity, cancer, and cardiovascular diseases (El-Sayed *et al.,* 2019). It should be noted that despite the many benefits of herbs and spices, one should be cautious to avoid excessive use and use of adulterated products. Excessive use and adulteration may lead to unwanted side effects for consumers (Eneojo *et al.,* 2024). Udara *et al*. (2021) provided an extensive list of commonly found beneficial herbs and spices, including chili, cinnamon, cloves, nutmeg, mace, ginger, garlic, fennel, scent leaves, turmeric, cumin, cardamom, vanilla, coriander, chia seeds, fenugreek, celery, paprika, sesame, tamarind, etc.

2. Literature review

Nigeria is blessed with numerous herbs and spices due to its rich biodiversity. Most times, herbs and spices are used interchangeably; however, it is worthy of note to state clearly that both are obtained from different plant plants. Spices are sourced from various plant parts, including flowers (e.g. marjoram and saffron), leaves (e.g. mint, bay and curry leaves), seeds (e.g. cardamom, coriander, pepper, nutmeg, star anise, tamarind, cumin, fennel etc.), buds (e.g. cloves), rhizomes (ginger and turmeric), stigmas (e.g. saffron), stems (Cinnamon), berry (black pepper), fruits (e.g. cardamom and chili), latex (hing spice), root (horseradish and angelica), bark (cinnamon and cassia), pods (tamarind and vanilla), and bulbs (onions and garlic) (Herrera *et al.* 2020). However, Herbs are derived from the dried or fresh leaves of aromatic medicinal plants. Eneojo *et al.* (2024) reported that this herb had found application in various aspects which include its use as condiments (e.g. Moringa, Bitter leaf, Aloe vera, Scent leaf, Waterleaf, Thyme, Cloves, Basils, Spring onions, curry, etc.), use as beverages (i.e. for infusion and tea, e.g. tea plant, eucalyptus, lemongrass, ginger, moringa, bitter leaf, basil, coriander, roselle and parsley, etc.), use as essential oils e.g. chamomile, fennel, basil, lemongrass, thyme, marjoram, peppermint, rosemary, oregano, sage, eucalyptus etc.).

3. Methodology

A systematic approach as described by Kitchenham *et al*. (2009) was adopted for this review, with a slight modification. This method involved a comprehensive evaluation that employed reliable, rigorous, and transparent methodologies. Extensive literature search was carried out using electronic databases such as PubMed, Scopus, and Google Scholar. The search focused on peer-reviewed articles, books, and reviews that discussed the roles of spices and herbs in various contexts.

4. Results and Discussion

A comprehensive overview of various spices and herbs, detailing their local and common names, traditional uses, medicinal properties, and key bio actives and antioxidants are presented in Table 1. The table categorizes each spice and herb based on its culinary and medicinal applications, highlighting the specific parts utilized. By summarizing their beneficial properties, this resource serves as a valuable reference for understanding the functional and health-promoting aspects of theses natural ingredients.

Table 1. Bioactive constituents of some herbs and spices in Nigeria and their uses

Name	Folklore/ Common uses	Medicinal effect Ethno-medicinal uses	Bioactive/Antioxidant compound	Parts used
English name: African Nutmeg Scientific name: Monodora myristica Family: Annonaceae Common/ Local name: Ehuru (Igbo), Abo Lakoshe (Yoruba)	The root is chewed to relieve toothache, and it is also used as spice in local delicacies.	It is used as a germicidal or antiseptic. It is also used in the treatment of constipation and as a stimulant. The essential oil from the seed is used in Pharmaceutical and dental preparations.	Mono terpenoids, phenols, saponins, alkaloids, steroids, tannins.	Seeds and roots.

Name	Folklore/ Common uses	Medicinal effect Ethno-medicinal uses	Bioactive/Antioxidant compound	Parts used
English name: Licorice Scientific name: *Glycyrrhiza glabra L* Family: *Fabaceae* Common/ Local name: Oburunbebe stick, Ewe omisinmisin (Yoruba).	It is used in the making of foam in firefighting, also used in the production of licorice honey and licorice sherbet as well as in the manufacture of tobacco and snuff. In traditional medicine, licorice root has been utilized for the treatment of a variety of conditions, including diseases of the chest and lungs, pneumonia, arthritis, bronchial asthma, gastric ulcers, oral ulcers, coughs, oedema, excessive salivation, allergies, flatulence, and various skin disorders. This extensive range of applications highlights the historical significance and therapeutic potential of licorice root in addressing diverse health issues.	Antioxidant, antimicrobial, antiviral, anti-inflammation and anti- proliferative activities. Licorice root extracts are associated with numerous therapeutic advantages, including the management of throat infections, tuberculosis, and respiratory disorders. Additionally, they demonstrate potential benefits in treating liver diseases, addressing cardiovascular issues, exhibiting anticancer properties, and providing hepato-protective effects.	Phenols (including liquiritin, liquiritigenin, isoliquiritin), isoliquiritigenin. Triterpenes (glycyrrhizin, glycyrrhetic acid), glabridin, formononetin, prenyllicoflavone A.	Root
English name Aidan fruit Scientific name: *Tetrapleuura tetrapleura* Family: *Leguminosae* Common/ Local name: Oshosho/Osakiris (Igbo), Uyayak (Efik), Prekese (Ghana).	It is used as flavour in soups. The treatment of back pain and cleansing of the digestive system.	They are reported to possess antitumour, antiviral, antibacterial, antioxidant, antimicrobial, antiproliferative, anticancer, anti-inflammatory, and antifungal activities. Lowering of blood pressure, enhanced immune system, malaria treatment, hypertension management, cancer prevention and diabetes.	Alkaloids, flavonoids, tannins, saponins, and glycosides.	Fruit, leave and stem
English name: Ginger Scientific name: *Zingiber officinale* Roscoe Family: *Zingiberaceae* Common/ Local name: African ginger, Black ginger. Jinja (Igbo), Atale (Yoruba), Cithar mai yatsu (Hausa).	It is used as a spice, as treatment of nausea and as a pain remedy. It is also used as a cholesterol-lowering herb.	Respiratory protective, anti-obesity, anti-diabetic, anti-oxidant, anti-nausea and anti-emetic during motion and sea sickness. Cardiovascular protective Anti-flatulent or carminative.	Gingerol, shogaol, beta-phellandrene, camphene, curcumene, terphineol, terpenes, borneol, geraniol, limonene, cineole, linalool, geranyl acetate, alpha-zingiberene, paradol. Zingiberol, beta-bisabolene zingerone, zingiberene, gingediol, P-coumaric-acid, terpinen-4-ol,	Rhizome

Name	Folklore/ Common uses	Medicinal effect Ethno-medicinal uses	Bioactive/Antioxidant compound	Parts used
			oleoresin, and phytosterols.	
English name: Garlic Scientific name: *Allium sativum* Family: *Liliaceae* Common/ Local name: Ayuu (Yoruba), Ayo-ishi (Igbo), Tafarnuuwa (Hausa).	It is used as a spice in combination with ginger and uziza. It is also used in the treatment of hypertension and as a blood cleanser. The powder is rubbed as a counter irritant for the skin.	Used in the treatment of intestinal disorders, respiratory diseases, inflammation, worm infestation and tumours. It is also used to lower blood pressure and support immune function. It has anti-diabetic, antioxidant, hepato-protective, cardiovascular, anti-fungi, anti-viral, anti-bacterial, and anti-cancer properties.	Ajoene, allicin, diallyl disulfide, vanillic, p-hydroxybenzoic, Vinyldithiins caffeic, and p-coumaric acids.	Bulb
English name: Onion Scientific name: *Allium cepa* Family: *Liliaceae* Common/ Local name: Albasa (Igbo), Isumeri (Yoruba).	It aids in the release of gas and throat infection. It is also used as an emetic and for the treatment of tuberculosis.	Antioxidant, antiproliferative, anti-inflammatory, and cardio-protective activities. Helps in regulating lipid metabolism and improving insulin resistance.	Anthocyanins, kaempferol, quercetin, cyanidin glucosides, taxifolin, peonidin glucosides, allicin.	Bulb
English name: Scent leaf Scientific name: *Ocimum gratissimum* Family: *Lamiaceae* Common/ Local name: Nchanwu (Igbo), Efirin nla (Yoruba), Daidoga (Hausa), Ihiri (Benin).	It is used to treat skin diseases and as soup spice. It is also used in the treatment of epilepsy, high fever, diarrhoea, cough and catarrh when inhaled. It can be infused and used as a remedy for stomach disorders such as gastroenteritis, stomach pain, cholera, chronic dysentery and emesis.	It exhibits antifungal activities.	Alkaloids, tannins, phytates, flavonoids and oligosaccharides.	Leaves
English name: Moringa Scientific name: *Moringa oleifera* Lam Family: *Moringaceae* Common/ Local name: Ewe ile/ igbale (Yoruba), Zongallagandi/Bagaruwar masar (Hausa), Odudu/Okwe oyibo (Igbo).	The leaves have medicinal properties and are used to treat various health conditions, including typhoid fever, malaria, diabetes, arthritis, and respiratory issues. They also stimulate lactation and boost immune function. The bark is macerated to create beverages and infusions that help with gastrointestinal ailments.	Analgesic, Immunomodulatory, anti-inflammatory, local anaesthetic, cardiovascular, anti-allergic, anti-microbial, hypoglycemic, antioxidant, anticancer, gastro-protective, blood lipid- reducing, hepato-protective, neuro-protective, and anti- diarrhoeal activities.	Apigenin, terpenoids, luteolin, phytosterols, caffeic acid, quercetin.	All parts (leaves, bark, roots and flowers)
English name: Turmeric Scientific name: *Curcuma longa* Linn. Family: *Zingiberaceae* Common/ Local name: Zabibi/ Gangamau (Hausa), Ata ile pupa (Yoruba), Nwandumo/ Ohu boboch (Igbo).	It is used as a spice and used in the cosmetic industry. It is used in the treatment of arthritis, smallpox, cough, jaundice, skin disease and anorexia.	Antiproliferative, anti-inflammatory, anti-cardiovascular, hepato-protective, carminative, anti-diarrheal, diuretic, anti-rheumatic, hypotensive, antimicrobial, antiviral, antioxidant, larvicidal, anti-diabetic, insecticidal and immune-stimulant activities.	Quercetin, curcumin, curcuminoids.	Rhizome

Name	Folklore/ Common uses	Medicinal effect Ethno-medicinal uses	Bioactive/Antioxidant compound	Parts used
English name: Grains of Selim Scientific name: *Xylopia aethiopica* Family: *Annonaceae* Common/ Local name: African pepper, Negro pepper, spice tree, west African pepper, Senegal pepper. Uda (lgbo), Sesdo (Yoruba), Kimba (Hausa), Aghako (Edo), Urheri (urhobo), Unien (Bini), Atta (Ibibio/Efik).	It is used as a condiment in soup and pepper soup as well as in preparing Agbo (local bitters). It is used to treat skin infections, candidiasis, cough, dysentery, dyspepsia, biliousness, bronchitis, rheumatism, uterine fibroid, malaria, amenorrhea, boils, sores, and fever. It is also used as a mouthwash. The powdered root is used as a dressing for sores and rubbed on the gums for pyorrhea. The leaf sap is mixed with kola nut and used to treat epileptic fits.	It has anti-tumour, anti-asthmatic, anti-inflammatory and antimicrobial activities.	β-pinene, α-terpineol, 1,8-cineol, terpinene-4-ol, Paradol, Bisabolene and other terpenes, myrtenol, β- and α-pinene, trans-pinocarveol, cryptone, verbenone, spathulenol, beta-caryophyllene and limonene.	Leaves, bark and fruit (seed)
English name: Lemongrass Scientific name: *Cymbopogon citratus* Familly: *Gramineae* Common/ Local name: Elephant grass, Tsabrae (Hausa).	It is used in the food industry as a flavouring agent and in beverages and herbal tea for cough as well as a remedy for nasal congestion. It is also used as an insecticide and a snake repellant in some parts of Africa and Asia countries. It has also found usage in perfume, cosmetics and in the confectionery industries.	It possesses Anti-inflammatory, anti-dyspeptic, antiseptic, anti-fever, antispasmodic, anti-hermetic, analgesic, antipyretic, diuretic and tranquilizer effects.	Fatty acids, flavonoids, Isovaleranic aldehyde, isopulegol, fumesol, methylheptenone, valeric esters, L-linanool, furfurol, P-coumaric acid, phytosterols, anthocyanic, citral, mycrene, grenoriel, citronellol.	leaves
English name: Black velvet Tamarind Scientific name: *Tamarindus indica* Family: *Fabaceae* Common/ Local name: African black velvet. Tsamiya (Hausa), icheku (Igbo), Awin/Ajagbon (Yoruba), Jetami (Fulani), tamsugu (Kanuri).	The fruit pulp is used as juice. It is also used as a seasoning or spice in sweetmeats, curries, and chutneys. It is used locally to prevent abortion of pregnancy.	Antibacterial, antitumour antidiuretic, antioxidants and anticancer properties Protection against LDL oxidation and DNA damage. Immunity booster, Immunopotentiating and Immunomodulatory activity.	Safrole, limonene, geraniol, vitamin C, flavonoids, phlobatannins, glycosides, saponins, terpenoids, steroids, and alkaloids.	Fruit, bark, roots, leaves, and seeds
English name: African Black peppers Scientific name: *Piper guineense* Family: *Piperaceae* Common/ Local name: Uziza (Igbo), Edusa Ibibio), Eti-nkeni (Efik), Iyere (Yoruba).	The plant is used as a spice due to its pungent and flavourful characteristics, particularly in soups intended for women after childbirth to promote uterine contractions. Additionally, it is commonly used in local treatments for rheumatic pain, weight management, and as an anti-asthmatic agent. The leaves are utilized to help	The plant exhibits antimalarial, antihypertensive, anticancer, antioxidant, antiplatelet, anti-inflammatory, antitumour, anti-allergic and analgesic properties. It is also used in the management of cardiovascular diseases.	Saponins, alkaloids, tannins, flavonoids, polyphenols, myristicin, elemecin, safrols, and β-caryophyllen.	Leaves and seeds

Name	Folklore/ Common uses	Medicinal effect Ethno-medicinal uses	Bioactive/Antioxidant compound	Parts used
	regulate the menstrual cycle and as an ingredient in remedies for female infertility.			
English name: Neem Scientific name: *Azardirachta indica* A. Family: *Meliaceae* Common/ Local name: Aforo-oyinbo (Yoruba), Ogwu Iba/ akom, Aku shorop (Igbo), Dogonyaro- (Hausa)	It is used for post-partum contraction. The leaf decoction and infusion are used for the treatment of chicken pox, smallpox and malaria. The Twig is chewed for toothache.	Anti-viral, anti-fungal, anti-bacterial, anti-helminths.	Azadirachtin, flavonoids and their glycosides, dihydrochalcone, coumarin, tannins, Isoprenoids (like diterpenoids and triterpenoids), vilasinin, and non-isoprenoids.	Bark, leaves and roots
English name: African ebony Scientific name: *Diospyros mespiliformis* Family: *Ebenaceae* Common/ Local name: Kanya (Hausa).	The raw, cooked, and dried fruit can be fermented into beverages. The resulting sweet flavour resembles that of persimmon and produces a soft coffee-like drink.	Antifungal, anticancer, antimalarial, anti-mutagenic, antioxidant and antibacterial properties. However, a significant side effect of this substance is that it can act as a strong DNA-damaging agent when administered in high doses.	Crassiflorone, gerberinol and plumbagin.	Stem bark/ leaves, fruit pulp
English name: Grains of paradise Scientific name: *Afromonium meleguetta* Family: *Zingiberaceae* Common/ Local name: Alligator pepper, Guinea pepper.Citta mai koko (Hausa), Ose oji (Igbo), Ehie ado (Bini), Ntuen (Efik), Oburo (Yoruba).	It is chewed with kola nut against throat irritation and aids blood circulation. It is traditionally used as a spice for flavouring food and as a remedy for digestive and intestinal health, dysentery, migraine, and fever.	Antibacterial, repellent, antioxidant, anti-inflammatory, and hypoglycemic.	6-paradol, 6-gingerol, and 6-shogaol.	seeds
English name: Stinging nettle Scientific name: *Urtica dioica* Family: *Urticaceae* Common/ Local name: Agbara/ Akuwa (Igbo), Osokporode (Urhobo), Ewe esinsin (Yoruba).	It is used as vegetables in the human diet as well as herbal tea. It is also used in the treatment of arthritis, constipation, intestine, kidney, diabetes, infection, internal injury and wounds	Hepato-protective, anti- fungal anti-hyper-lipidemic, anti-inflammatory Diuretic, Antimicrobial and Anti-cancer activities.	Hydroxycinnamic acid, tannins, flavonoids, lutein, beta-carotene, flavonoids, sterols, phenolic acids, lignans, flavones, Coumarins, flavonoids, and bi-flavonoids.	leaves
English name: Coco plum Scientific name: *Chrysobalamus icaco* Family: *Chrysobalanaceae* Common/ Local name: Rough-skinned Gbafilo (Itsekiri).	It is used as oil and in traditional medicine. It is also used as spice in pepper soups, soups and stews. In some parts of Africa.	Anti-inflammatory, hepato-protective antihistaminic, anticancer, antioxidant, antimicrobial, anti-arthritic properties, diarrhoea. Controls blood pressure and stomach disorder and is used in the treatment of malaria and fever.	Methyl ester, cis-13-octadecenoic acid, hexadecanoic acid, cis- vaccenic acid, oleic acid.	Fruit, leaves, and Seed
English name: Clove Scientific name: *Syzgium aromaticum* Linn Family: *Myrtaceae*	It is used as a spice in cooking, traditional tea and herbal medicine.	Antioxidant, antimicrobial, antibacterial, anti-inflammatory and antifungal activities.	Eugenol, flavonoids, eugenol acetate,	Bud

Name	Folklore/ Common uses	Medicinal effect Ethno-medicinal uses	Bioactive/Antioxidant compound	Parts used
Common/ Local name: Kanunfuri (Hausa).			and β-caryophyllene.	
English name: Guinea Bissau Scientific name: *Chrozophora senegalensis* Family: *Euphorbiaceae* Common/ Local name: Damagi (Hausa), Walkin maciji (Hausa).	Root and leaf decoctions are drunk for hair loss, diarrhoea, rheumatism, teniasis, stomachache, and venereal diseases The seed of this plant is used as a contraceptive and in the treatment of cataracts.	Antimicrobial, anti-plasmodial and anti-tumour activities.	Di-terpene esters, alkaloids, saponins, flavonoids and tannins.	Leaves, roots and seeds
English name: Bush Buck Scientific name: *Gongronema latifolium* Family: *Asclepidiaceae* Common/ Local name: Amaranth globe. Utazi (Igbo), Aunje- Adiye/ Arokeke (Yoruba).	It is employed in the management of diabetes and hypertension. It serves as both a spice and a garnish for various traditional dishes and soups. Furthermore, the leaves and stems are utilized to treat digestive disorders, including loss of appetite, dyspepsia, colic, abdominal pain, constipation, dysentery, and intestinal parasitic infections.	Analgesic, broad-spectrum antimicrobial, anti-tumour, antipyretic, anti-inflammatory, antiulcer, antioxidant, anti-sickling, anti-asthmatic activities. Mild expectorant, hypolipidemic, hypoglycaemic, hepatoprotective, and laxative properties.	Saponins and alkaloids.	Leaves
English name: Black seed Scientific name: *Nigella sativa* Family: *Ranunculaceae* Common/ Local name: Black cumin.	It is used to boost the body's immunity, as food flavouring, and traditionally to increase milk production in nursing mothers. It is also used in the treatment of cough, rheumatoid arthritis, skin diseases, diabetes and hypertension.	Diuretic, spasmolytic, analgesic, antihypertensive, anti-diabetic, anti- inflammatory, antimicrobial, anti-helminthic anticancer, immune-modulatory and antioxidant properties. Bronchodilator, gastro-protective, and hepato-protective.	Thymoquinone, dithymoquinone, thymohydroquinone, p-cymene, carvacrol, 4-terpineol, sesquiterpene longifolene, t-anethol, alpha-hederin, saponin, carvone, thymol, alkaloids, limonene, citronellol.	seeds
English name: Heart-fruit Scientific name: *Hymenocardia acida* Family: *Euphorbiaceae* Common/ Local name: Ii-kwarto (Tiv), Enache (Idoma), Jan yaro (Hausa), Yawa satoje (Fulani), Ikalaga (Igbo), Orunpa (Yoruba).	It is used to treat asthma, fever, urinary tract infection, haemorrhoids, chest, menstrual and abdominal pains and as poultices on abscesses. The leafy twig extract is rubbed in to strengthen sickly children. The leaf sap is used as eye drops to treat eye infections and eardrops to treat otitis. The vapour of boiling leaves and leaf powder is inhaled to treat headaches.	Analgesic, vaso-relaxant antioxidant, antimicrobial, anti-inflammatory, anthelminthic, antihypertensive, and anti-trypanosomal scavenging activities.	Saponins, tannins, flavonoids, flavonols, phenols, proanthocyanidins, steroids, triterpenoids alkaloids, glycosides.	All plant part
English name:Bridelia Scientific name: *Bridelia ferruginea* Family: *Euphorbiaceae*	In Togo, the bark of the root is used as a remedy for intestinal disorders and for treating skin diseases. An extract from the bark serves	Anti-plasmodial, anti-leishmanial, antidiarrhoeal, ulcer-protective, antimicrobial, anti-neuro-inflammatory, antibacterial and hypo-glycemic activities.	Saponins, alkaloids, tannins, anthraquinones and flavonoids.	Stem bark and leaves

Name	Folklore/ Common uses	Medicinal effect Ethno-medicinal uses	Bioactive/Antioxidant compound	Parts used
Kirni (Hausa), Marehi (Fulfulde) Ira lodan (Yoruba), Ola (Igbo).	as an antidote for arrow poison and is also used in the coagulation of milk and lime juice to create a traditional gargle known as "egunefu."	Radical scavenging and xanthine oxidase inhibition.		
Scientific name: *Spenocentrum jollyanum* Family: *Menispermaceae* Common/ Local name: Akerejupon or Ajo (Yoruba).	The juice from the root is believed to relieve abdominal pain, and constipation, increase sexual drive and treatment of gastric ulcers. The root is used as an aphrodisiac by men when ground into powder and drunk with pap or water.	Anti-diabetic, antioxidant, anti-inflammatory, anti-depressant and haematological activities. Treatment of hypertension, irregular menstrual flow and breast tumour.	Alkaloids, phenols, phlobatanins, saponins, tannins, terpenes, camphene, δ-3-carene, globulol, 5-guaiene11-ol, p-cymene, α-eudesmol, β-pinene, anthraquinones, steroids, and flavonoids	Root, fruit and root
English name: Stink Ant Forest Scientific name: *Olax subscorpiidea* Family: *Olacacea* Common/ Local name: Ifon /Ufon (Yoruba), Gwaanon kurmii/Gwaanon raafii (Hausa), Igbulu/Atu-ogili/Osaja (Igbo), Ukpakon (Edo), Ocheja (Igala).	The roots of this plant are recognized for their aphrodisiac properties and are applied topically to address cutaneous and subcutaneous parasitic infections. The stem bark is frequently utilized as a chewing stick and in the formulation of herbal remedies for dental and oral health. Additionally, this plant is employed in the treatment of various medical conditions, including arthritis, constipation, cough, dermatosis, fever, headaches, jaundice, malaria, rheumatism, syphilis, and ulcers.	Management of mental diseases, convulsion, inflammation, cancer, infectious diseases, hepatic diseases, asthma, gastrointestinal disorders. Treatment of diabetes mellitus and depression.	Saponins, alkaloids, tannins, flavonoids, steroids, terpenoids and phenols.	All parts
English name: Swizzle stick Scientific name: *Rauwolfia vomitoria* Family: *Apocynaceae* Common/ Local name: Serpent wood, Serpent snake root. Asofeyeje (Yoruba), Ira (Igbo), Wadda (Hausa), Akata (Bini), Utoenyin (Efik).	It is used in the treatment of dysentery, jaundice, snakebites, gastrointestinal disturbances and hypertension.	Anti-cancer, lipid-lowering, teratogenic, anti-filarial, antihelmintic. Antioxidant, anti-inflammatory, anti-glycemic and anticonvulsant activities.	Alkaloids, saponins, tannins, steroids, flavonoids and cardiac glycosides.	Leaves and bark
English name: Bishop`s head Scientific name: *Nauclea latifolia* Family: *Rubiaceae* Common/ Local name: Mbom-mbog (Akwa Ibom/Cross River States),	It is used in folkloric medicine to manage malaria, jaundice, diarrhoea, stomachache, fever, hypertension, cancer, tuberculosis and nematodes infections in humans and	Antioxidant, anti-diabetic, anti-cholesterol, anti-hypertension, anti-malarial, anthelmintic, anti-viral and antibacterial activities.	Saponins, alkaloids, glycosides, tannins, flavonoids and anthraquinones.	Leaves and stem bark

Name	Folklore/ Common uses	Medicinal effect Ethno-medicinal uses	Bioactive/Antioxidant compound	Parts used
Ubululilu (Igbo), Agbaseagbase (Yoruba). Tabashiya (Hausa).	animals. It is also used as a chewing stick.			
English name: Pigeon Pea Scientific name: *Cajanus cajan* Family: *Fabaceae* Common/ Local name: Wake masa (Hausa), Fiofio (Igbo), Otili (Yoruba), Agwuagwu (Igala).	For the management of diabetes, dysentery and hepatitis. The leaves are used for the treatment of wounds, measles, smallpox, chicken pox, bedsores, and malaria; Its woody stalk serves as fuel and is also used in basket weaving and thatching.	Free radical scavenging capacity. Antioxidant, hepato-protective, hypo-cholesterolemic, anti-plasmodial anti-diabetic anti-inflammatory, anti-cancer and antimicrobial activities.	Alkaloids, flavonoids, polyphenols, tannins and cardiac glycosides.	Leaves, wood and seeds
English name: Cissus Plant Scientific name: *Cissus populnea* Guill. & Perr Family: *Vitaceae* Common/ Local name: Okoho (Idoma/ Igala), Ogbolo ajara (Yoruba), Dafaaraa (Hausa).	The plant is utilized in the treatment of several medical conditions, including skin diseases, boils, and infected wounds, as well as urinary tract infections. It acts as an antidote for arrow poison and is commonly prepared as a vegetable soup to address postnatal hemorrhaging in specific regions of Nigeria. Furthermore, the roots are employed in the management of sore breasts among women following childbirth. The fibers derived from the plant are also used in binding materials, paper production, and basket weaving.	Anti-bacterial, antiviral diuretic and astringent properties.	Alkaloids, tannins, saponins, flavonoids and anthraquinone.	leaf, stem and root
English name: Acalypha plant Scientific name: *Acalypha wilkesiana* Family: *Euphobiaceae* Common/ Local name: Copperleaf, Jacob's coat Calico, Beefsteak Plant, Fire bush, Fijan fire plant and Fire dragon.	The plant is used to treat malaria and various gastrointestinal and dermatological disorders and In Southern Nigeria, it serves as a remedy for unspecified skin infections in children. It is also used to treat headaches, colds and swellings. The seeds are also used to treat breast tumours in South-West, Nigeria. In some parts of Africa, the shoots without flowers are cooked as vegetables and in making baskets.	Antifungal, antioxidant, antibacterial, anthelmintic, anti-hypertensive, anti-obesity, anti-malaria, anti-cancerous, anti-inflammatory, anti-microbial, and anti-pyretic activities.	Tannins, flavonoids, steroids, cardiac glycosides, saponins, anthraquinan, oxalate and terpenoids.	leaves
English name: Indepenent leaf Scientific name *Chromoleana odorata*	Treatment of dysentery, headache, toothache, diarrhoea, stomach	Anti-microbial, anti- inflammatory, anti-diabetic, anti-diarrhea, anti-	Flavonoid, aglycones, protocatechuic	leaves

Name	Folklore/ Common uses	Medicinal effect Ethno-medicinal uses	Bioactive/Antioxidant compound	Parts used
Family: *Asteraceae* Common/ Local name: Armstrong's weed, baby tea, bitter bush, butterfly weed, Christmas bush, devil weed, eupatorium, Jack in the bush, Akintola, Queen Elizabeth weed. Ewe awolowo (Yoruba), Ogbeko or Shell-copy (Delta), Obialofulu (Igbo).	problems, coughs, skin infections and wounds. A local antiseptic agent, insecticidal insect repellent and antibacterial activities.	cancer, anti-analgesic, hemostatic and antioxidant activities.	acid, ferulic acid and luteolin.	

Source: Author bibliographic research

4.1 Spices and Herbs as Value-Added Products

Numerous spices and herbs are purported to have therapeutic properties and consumption of a diet abundant in spices and herbs fosters an environment rich in bioactive substances which are believed to yield health and protective benefits (Sunday, 2018; Eneojo *et al.,* 2024). These bioactive substances contribute to their application for value-addition purposes in the food industry, as preservatives, colorants, flavour enhancers, food supplements, and in the preparation of edible coatings (Eneojo *et al.,* 2024). This various application of spices and herbs in the food industry has been found to improve quality, aesthetic appeals and the overall acceptability of agricultural products (Fasoyiro, 2015; Sunday, 2018).

Table 2. Spices and Herbs: Application in Food Industry

S/No	Applications	Examples of Spices and Herbs Used
1	Food Flavor/ Preservation	Nutmeg, cloves, ginger, fenugreek, Black Pepper, Chili, Cumin, Cardamom, basil, fennel, marjoram, oregano, peppermint, rosemary, sage, thyme, and chamomile. Udara *et al*. (2021) and Leja *et al*. (2016)
2	Food supplements/ Functional Food	Spent Residues of Cumin, Ginger, Celery, Turmeric, coriander, and cloves. Sowbhagya (2019)
3	Edible Coatings	Aloe vera, lemongrass, Tulsi, oregano, mint, clove, neem, and cinnamon. Rajial *et al*. (2024)
4	Therapeutic	Ginger, curcumin, cumin, capsaicin, black pepper, mustard, fenugreek, cayenne pepper, onion and bay leaf. Balasasirekha, 2014
5	Herbal Drinks/Tea	Eucalyptus, moringa, tea plant, basil, lemongrass, bitter leaf, coriander, ginger, roselle and parsley. Samiha *et al.* (2022)

Source: Author bibliographic research

One of the major challenges with Herbs and spices is that some of them are seasonal and this affects their all-year-round affordability, availability and accessibility (Datta *et al*. 2015). To ensure year-round availability, it is essential to enhance the value of herbs and spices. This will allow humanity to continue reaping the benefits associated with these important natural products. The advantages of adding value to herbs and spices include increased portability, reduced risk of bacterial contamination, prolonged flavour, affordability, and improved availability. Value-added products are achieved through series of unit processes to transform the raw products to a more durable, stable and valuable form. These forms include powders, teas, sweets, functional foods, essential oils and oleoresins (Eneojo *et al.,* 2024).

4.2 Spent residue of spices and their potential application/use.

The main spice products highly sought-after in the export market are spice oils (essential oils) and spice oleoresins. After the extraction of these products, the spent, known to be rich in nutrients majorly dietary fibre, vitamins and minerals, can be used for other purposes through value addition (Sowbhagya 2019). Cumin spent residue has been reported to contain a significant amount of dietary fibre (62.1%), zinc and iron, which has made it a useful material in the production of healthy and functional products (Sowbhagya *et al.*, 2007; Milan *et al.*, 2008; Eneojo *et al.,*

2024). Ginger spent residue is rich in crude fibre, potassium, calcium and phosphorus (Madeneni *et al*., 2011), which is useful in the production of starch with high gelatinization properties and digestibility, animal feeds as well as the production of Bioethanol and polyurethane green composites (Omage *et al.*, 2007; Udara *et al.,* 2021; Chethana *et al*., 2014). Coriander spent contains a total dietary fiber of 51.7% and high levels of calcium, potassium, zinc, iron, and manganese (Chien and Potty, 1996), which is useful in adding value to flour for bread production (Sowbhagya, 2019). Residual spent of cloves present an innovative opportunity as a source of dietary fiber, protein, and essential minerals (Al-Jasass and Al-Jasser, 2012). Turmeric spent was found to contain 43% insoluble fiber, 45% dietary fiber, 2% soluble fiber and this makes it very useful in the production of starch (Kuttigounder *et al.*, 2011). Due to its high carbohydrate content, turmeric spent can serve as a functional ingredient in the food industry and in the preparation of biofilms for packaging (Borse *et al.,* 2010; Maniglia *et al.*, 2015). Chili spent residue (CHSR) is reportedly rich in dietary fiber (44.4%), insoluble dietary fiber (34.9%), soluble dietary fiber (9.5%), and protein (19.7%). As a result, it is often employed as an egg yolk coloring agent, particularly in chicken feeds where it is integrated into leghorn layers (Yami *et al.,* 2002). Also, the inclusion of chili-spent residue at an optimal level resulted in a significant increase in dietary fiber, protein content, and mineral content of bread (Sowbhagya *et al.*, 2015). The residual material from black seed/ black cumin contains a high concentration of crude protein and as a result, it is commonly utilized as a valuable source of feed protein for lambs, leading to a considerable enhancement in their growth performance (Retnani *et al.,* 2019). The residual components of onions have been recognized as containing a range of valuable compounds, including flavour compounds, fiber, non-structural carbohydrates, and polyphenols (Vojvodić Cebin *et al*., 2020). This characteristic presents an opportunity for the utilization of onion waste as a source of functional food ingredients for enriching the antioxidant and prebiotic properties of innovative food products (Vojvodić Cebin *et al.* 2020). In addition to this, derivatives from onions, such as onion peel powder and its extract, are utilized in the production of gluten-free bread, wheat flour extrudates, emulsion pork sausage, and bean paste. (Lee *et al*., 2015; Sęczyk *et al*., 2015; Tonyali and Sensoy, 2017; Bedrnicek *et al*., 2020).

5. Conclusions

Herbs and spices have evolved from low-cost commodities to valuable assets due to their essential roles in food flavouring, preservation, and medicine. Their rich history and extensive applications in various industries underscore their enduring importance. Nigeria's diverse range of herbs and spices further enhances their global significance. These natural products offer numerous health benefits, including anti-oxidative and therapeutic properties, making them crucial in extending food shelf life and enhancing sensory qualities. However, it is essential to use them responsibly to avoid adverse effects from consumption or adulteration. Value-addition processes ensure year-round availability, portability, and reduced contamination, boosting their economic value. Utilizing spent residues from these spices in food products and animal feed presents sustainable and innovative opportunities. Overall, the versatile nature of herbs and spices ensures their continued relevance in culinary, medicinal, and industrial applications, promoting a healthier and more sustainable future.

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