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Beneficial activities of ethnobotanical plants on selected systems and agriculture

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Abstract
Recent scientific studies have focused heavily on the use of medicinal plants in agriculture and folkloric medicine as a complementary therapy, preventive strategy, or full therapy. Phytotherapy is being used more and more frequently for preventive purposes, the treatment of minor or chronic diseases, and recurrent infections, and for the advancement of organic livestock. In order to increase the activity of the immunological or reproductive systems and stimulate biochemical, haematological, or certain organ functions, extract preparations of several plants have been utilized. Many herbal metabolites have demonstrated antibacterial, antioxidant, reproductive enhancement and insecticidal properties. The most often utilized plants for health, reproduction, parasites, and insect pests' control were carefully reviewed in this article.

Keywords: Ethnobotanical, medicinal plants, fertility, insect pests, anthelminthic activity, antioxidant

1. Introduction
People relied on plants for the treatment and prevention of diseases in humans and animals before the invention of pharmaceutical medications and iatrochemistry in the sixteenth century (Dzoyem *et al*. 2020; Abera and Mulate 2019; Gakuubi, 2012; Kelly 2009) [39, 3, 47, 75]. In the beginning, the effectiveness of medicinal herbs was determined by instinct (Jamshidi-Kia *et al*. 2018; Pan *et al*. 2014) [69, 125s]. The earliest known instances of ethnomedical practice date to around 3000 BCE. Indian, Egyptian, Chinese, Greek, and Roman civilizations all showed the therapeutic value of medicinal plants by using them to treat a variety of illnesses as well as to energize their bodies (Pan *et al*. 2014) [125]. The use of medicinal plants has grown over time, particularly in light of the downsides of synthetic drugs and chemicals (Kumar *et al*. 2022; Suleiman *et al*. 2016) [83, 152], including the decline in their efficacy, resistance, and toxicity in addition to growing concerns over the presence of drug and chemical residues in animal products and agricultural practices that increased the health risks posed to consumers and the environment (Ramdani *et al*. 2023; Gainza *et al*. 2021; Archana, 2014) [134, 46, 13].
In Africa and other regions of the world, medicinal plants make up around 95% of all traditional medicine formulations (Ozioma and Okaka 2019; Gude 2013) [123, 56]. These plants are widely available in local communities and have long been trusted by resource-constrained farmers as a powerful source of healthcare with little adverse effects (Mensah *et al*. 2019; Saleh *et al*. 2015) [104, 140]. Many plants produce secondary metabolites, which have been shown to protect plants, animals, and humans from bacterial, fungal, parasite and insect activities (Manukumar *et al*. 2017; Ngulde *et al*. 2015) [99, 111]. They are also involved in the biochemical processes of growth and reproduction (Sadiq *et al*. 2018; Patra & Saxena 2009; Rochfort *et al*. 2008) [138, 127, 137]. Over the years, phytochemicals in plants have also provided an essential pathway for pharmaceutical advancement (Okhale *et al*. 2016) [117]. As a result, a review of these ethnobotanicals and their applications and effectiveness in phytotherapy needs periodic updating because research in this area keeps expanding. Thus, the goal of this review was to summarize recent research on the impact of medicinal plants on (1) enhancing reproductive performance as well as acting as an abortifacient; (2) preventing common parasitic infections in livestock, including insect pests in agriculture; (3) the antioxidant-defence potential of phytochemicals; and (4) some notable applications of ethnomedical plants (phytotherapy).

2. Effect of medicinal plants on reproductive parameters

Due to decreased milk supply, fewer calves born, and an increased culling rate, infertility in dairy cows results in significant financial losses for producers (Perumal *et al*. 2013) [129]. Herbs are considered alternative medications, and are very useful for managing diverse disorders in reproductive performances (Adeniran *et al*. 2020) [5]. The effectiveness of many medicinal herbs on reproductive performance in test animals has been supported by several studies (Shai *et al*. 2022) [144]. These studies have proven that medicinal plants provide potent alternative treatment for animal infertility (Biressaw 2017) [24]. Chandra & Purohit (2020) [27] listed a variety of medicinal plants; *Myrtus communis*, *Viola species*, *Nigella sativa*, *Pedalium murex*, *Entada pursaetha*, *Pandanus odoratissimus*, *Viburnum foetidum*, and *Plantago species* that are used to treat reproductive disorders, such as prolapse of the uterus, puerperal and uterine diseases. The chemical composition, antioxidant and antibacterial properties of *Alchornea cordifolia* help to treat infertility brought on by reduced spermatogenesis (Ebenyi *et al*. 2016) [40]. In Southeastern Nigeria, *Diospyros canaliculata* and *Diospyros mespiliformis* roots, stems, bark, and leaves are used for the treatment of infertility (Monier, 2016) [105]. According to Ogbuew *et al*. (2015) [116], *Ficus sycomorus*, *Monodora myristica*, *Uvaria chamae*, *Newbouldia laevis*, and *Xylopia aethiopica* are used for boosting animal conception rates. A decoction of deer horn glue (*Morinda officinalis*, Angelica liquorice), given to cows twice daily for three days, exhibited an efficacy of 88.9% against infertility (Liu *et al*. 2014) [87]. According to Cong *et al*. (2015) [29], common Cnidium fruit, yellow sophora root, Chinese goldthread rhizome, and licorice produced 100% recovery and fertility in the test animals. Safflower, cowherb seed, Epimedium, Actinolite, *Morinda officinalis*, *Fructus psoraleae*, *Astragalus membranaceus*, *Ligusticum wallichii*, *Semen cuscutae*, and Kudzu vine root demonstrated extremely high efficacy in increasing conception rates (He *et al*. 2012; Liu *et al*. 2013) [63, 86]. Saponins and alkaloids, the active components of fenugreek seeds (*Trigonella foenum-graecum*), improves animal performance (Ahmed, 2009) [9]. According to Hassan (2012) [61], fenugreek oil enhances ovarian activity. Rajkumar *et al*. (2008) [132] investigated the effects of *Trigonella foenum-graecum* seeds and *Saraca asoca* stem bark on reproductive function, serum progesterone levels, and micromineral profiles in anestrus cows and found that both the percentage of animals prompted to oestrus and overall pregnancy rate were high. According to a study by Kumar *et al*. (2015) [80], *Asparagus racemosus* is a scientifically proven tonic for the reproductive system, immunomodulator, antioxidant, and anti-stress agent. To boost the rate of conception, the whole *Hydrilla verticillata* plant, *Lens culinaris subsp. culinaris* seed, *Myristica fragrans*, *Ricinus communis*, *Triticum aestivum*, and *Pandanus tectorius* flower are given to both female and male (Kumar and Kumar, 2013) [81]. Repeat breeder cows have been treated successfully using medicinal plants including *Lawsonia inermis* (leaves), *Musa paradisiaca* (leaf extract), *Cordial sp.* (leaves), *Convolvulus microphyllus* (roots), *Cicer arietinum* (Germinated Bengal gramme), and *Pedalium murex* (fruits) (Das *et al*., 2002) [32]. *Radix bupleuri*, *Semen litchi*, Fennel, Frankincense, Notopterygium root, Peach kernel, Motherwort, *Radix codonopsis*, Safflower, Licorice, and others have been used to treat retained placenta with success (Lv *et al*. 2014; Chen et. 2015; Li *et al*. 2015) [90, 28, 85]. According to Dharani *et al*. (2015) [35], a variety of extracts made from the leaves of *Acalypha fruticosa*, *Aloe secundiflora*, the bark of *Acacia oerfota*, *Acacia drepanolobium*, and *Azadirachta indica* seeds are useful in treating venereal diseases. *Epimedium sagittatum*, also known as horny goat weed, is a popular aphrodisiac and boosts sperm cell production (Perumal *et al*. 2013) [129]. Studies on *Murraya koenigii* and *Aegle marmelos* separately and together have shown their potency in establishing estrus, ovulation, and pregnancy in anestrus goats, cows, and buffaloes. Additionally, *A. marmelos* and *M. koenigii* increased endogenous antioxidants while decreasing the bacterial load and inflammation in endometritic dairy cows (Ravi *et al*., 2018; Rautela *et al*., 2018) [136, 135]. Animals are given various mixtures of extracts made from the leaves of *Acalypha fruticosa*, *Tinospora cordifolia*, *Cassia fistula* bark, and *Artocarpus heterophyllus* L. to treat anestrous (Talukdar *et al*., 2015) [153].

Male factor infertility frequently occurs from testicular conditions that produce insufficient sperm, both in terms of number and quality. Studies utilizing various herbal products revealed both beneficial and harmful effects of several botanical products on the testes and spermatogenesis (Shepherd *et al*. 2022) [146]. Herbs and plants aid in sperm production, ejaculation strength, sperm volume, sperm counts, and overall sexual wellness (Kuralkar & Kuralkar, 2021) [84]. *Tribulus terrestris*, *Tinospora cordifolia*, *Eurycoma longifolia*, and *Leuzea carthamoides* feeding promotes daily sperm production, sperm survival, improved sperm survival time, increased semen volume, sperm motility, percentage of viable spermatozoa, sperm concentration, morphologically normal spermatozoa, and sex libido (Jayaganthan *et al*. 2013; Frydrychova *et al*. 2011) [70, 44]. Sexual activity and performance are enhanced by the ethanolic extract of *Cleome arabica* (Boublata *et al*. 2021; Habbachi *et al*. 2020) [25, 58]. Testicular oxidative damage, affecting the inflammatory response and apoptotic-related pathways, was lessened by green coffee administration. According to Wafa *et al*. (2020) [160], green coffee has an effect through boosting of antioxidant activity, reducing inflammatory response, and blocking the apoptotic pathway in the testes. Although it did not affect testosterone levels, *Ceratonia siliqua* L. syrup was said to be more effective than vitamin E at enhancing semen quality (Aghajani *et al*. 2021) [7]. It is important to note here that the testis is vulnerable to herbal medications on both ends. For instance, *Tripterygium wilfordii* and cotton seed-derived gossypol harm the testes and male fertility, whereas *Withania somnifera* and the Qilin Pill increase testosterone levels and spermatogenesis (Shepherd *et al*. 2022; Mukherjee *et al*. 2021; Durg *et al*. 2018; Lopez *et al*. 2005) [146, 108, 38, 89].

3. Abortifacient activity of medicinal plants

Many herbs used traditionally as contraceptives are spermicidal (Abu *et al*. 2012) [4], abortifacient (James *et al*. 2011) [67], decreasing implantation sites, and affecting oestrous cycle (Koneri *et al*. 2007; Oluyemi *et al*. 2007) [78, 120]. Due to its affordability, accessibility, and perceived lack of adverse effects, herbal contraceptives are in high demand (Abu *et al*. 2012) [4]. The aqueous leaf extract of *Annona senegalensis* has abortifacient properties since it decreases progesterone levels, decreases implantation sites, and causes foetus resorption and implantation losses (Mbaya *et al*. 2019) [101]. According to Asefa *et al*. (2021) [16], Ethiopian women use leaves of *Azadirachta indica* to induce abortion. The dietary spice *Curcuma longa* (turmeric), which is high in phytoestrogen, is also reported to have contraceptive properties (Ramadan *et al*. 2011; Habash *et al*. 2000) [133, 57].

Abortion is performed using a decoction made from the roots and leaves of *Combretum racemosum* P. Beauv. (Omotayo and Borokini, 2012; Ibe and Nwufo, 2005) [121, 64]. In some regions of Nigeria, *Lawsonia inermis* has been used to induce abortions (Uleh *et al*. 2017) [156]. The abortifacient activity of *Alstonia boonei*, *Rauvolfia vomitoria*, *Piper guineense*, *Zingiber officinale*, and *Spondias mombin* has been reported in Southeast Nigeria as well (Ogbuew *et al*. 2015) [116]. Gossypol, an extract from cotton seeds, was found to be an effective contraceptive and equally poisonous to testicles according to clinical investigations (Lopez *et al*. 2005) [89]. *Azadirachta indica* methanolic seed extract inhibited reproduction in female albino rats. Its mechanism of action may be hormonal, specifically through the suppression of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) (Njoga *et al*. 2022) [113].

4. Effects of medicinal plants on parasites

The utilization of indigenous beliefs, knowledge, skills, techniques, and practices relating to animal health care referred to as ethno-veterinary medicine (EVM) is an option for treating both internal and external parasites in cattle production systems (Mathius-Mundy & McCorkle, 2004) [100]. In the future, medicinal plants may be crucial in the control of helminth infections in tropical and subtropical countries because they are somewhat less hazardous and have fewer adverse effects (Balagizi *et al*. 2021) [18]. Treatment for parasitic infections may be improved with the use of herbal medications. Herbal therapy can treat and manage several parasitic infections (Jamil *et al*. 2022) [68]. The livestock business faces a significant global threat from intestinal helminth infections (Mechineni *et al*. 2014) [102]. Newbold *et al*. (2017) [110], also opined that helminthiasis is a persistent issue in the chicken business and causes significant financial losses. Local livestock breeders have used a variety of plants and plant-based products to manage parasites and increase livestock output (Abdu *et al*. 2000) [2]. According to Afolayan and Sowemimo (2022) [6] and Ouachinou *et al*. (2017) [117], *Vernonia amygdalina*, *Carica papaya*, and *Azadirachta indica* are used to treat intestinal worms. *Detarium microcarpum* has shown effective deworming activity and is also used to treat several ailments, including dysentery, diarrhoea, and genital disorders, in many parts of Africa (Akah *et al*. 2012) [11].

In several parts of China, traditional healers and farmers have employed plant ingredients extracted from leaves, roots, seeds, flowers, and bark as anthelmintic agents (Lv *et al*. 2014) [90]. In many regions of the world, medicinal herbs have been utilized for centuries to fight parasitism and are still used for this purpose today (Bauri *et al*. 2015) [19]. Essential oil from *Zanthoxylum simulans* demonstrated promising anthelmintic properties against *Haemonchus contortus* eggs and larvae. By the anthelmintic properties of its essential oil against nematodes, the traditional use of Z. *simulans* against intestinal parasites has been scientifically demonstrated (Qi *et al*., 2015) [131]. *Zanthoxylum armatum* leaf infusion and bark pastes are used to manage endoparasites. The same with *Schima wallichii* and *Aloe barbadensis* (Bhat *et al*. 2023) [22]. According to Bhat *et al*. (2023) [22], *Zanthoxylum armatum* leaves and bark extracts exhibit strong toxicity against endoparasites due to the presence of limonene, linalool, and cinnamic acid. *Leishmania* species (*L. major*, *L. braziliensis*, and *L. chagasi*) have been proven to be extremely susceptible to limonene. The larvae and adult stages of *H. contortus* exhibited less hatching and motility in response to crude extracts of *Artemisia herba-alba* and *Punica granatum*. As a result, they may be able to manage ruminant gastrointestinal parasites (Ahmed *et al*. 2020) [10]. *Punica granatum* significantly affects both protozoan infections (Dell'Agli *et al*. 2009) [34] and cestodes and nematodes (Abdel-Ghaffar *et al*. 2011) [1]. According to William *et al*. (2016) [163], the bark of the *Khaya senegalensis* tree is effective in the treatment of liver fluke. The effectiveness of plant-based alkaloids as an anthelmintic was validated by Wang *et al*. (2010) [161]. By inhibiting egg embryonation, lowering the number of faecal eggs, and decreasing the number of the parasite. *Vernonia amygdalina* extract and fractions showed antihelmintic efficacy against *Ascaridia galli* (Gasaliyu *et al*. 2022; Saftri *et al*. 2019) [50, 139]. *Heligmosomoides bakeri* mortality and *Ascaris suum* motility inhibition were both increased *in vitro* by the use of aqueous and ethanol leaf extracts from *V. amygdalina*, respectively (Nweze *et al*. 2013) [114]. *Connarus africanus* seed, root, and bark are anthelmintic. Helminth, filariasis, and malaria illnesses are treated with the leaves and roots of *Amaranthus viridis*. *Anogeissus leiocarpus* is said to be a taenicide and skin conditions are also treated with its bark, leaves, and seeds. *Cucurbita maxim* seeds and fruits are purportedly used to treat tapeworms. *Harungana madagascariensis*, *Embelia guineensis*, *Delonix regia*, *Antidesma venosum*, *Croton lobatus*, *Jussiaea linifolia*, *Ludwigia suffruticosa*, *Opilia celtidifolia*, *Areca catechu*, *Blighia sapida*, *Cola millenii*, *Clerodendrum capitatum*, *Afrormosia granum-paradisi*, *Boscia senegalensis*, and *Balanites aegyptiaca* have been utilized for the treatment of various parasites (Monier, 2016) [105]. *Khaya senegalensis* is used to treat guinea worms in some parts of Nigeria, while *Mangifera indica* and *Musa sapientum* are used to treat malaria parasites (Uleh *et al*. 2017) [156]. The methanolic and ethyl acetate extracts of *Psidium guajava* had potent anti-inflammatory and anticoccidial properties (Yamssi *et al*. 2018) [166].

Ecto-parasites, notably ticks and pathogens carried by ticks, are one of the main health issues affecting livestock (Schroeder & Reilly, 2013) [142]. Ticks have significant negative influence on the livestock business and cause significant financial losses (Patoliya *et al*. 2022) [126]. After 5 hours of treatment, extracts made from *Azadirachta indica* leaf, seed, and bark demonstrated a very high level of efficacy (80%) against ticks (Ghosh *et al*. 2015) [55]. In addition to having antifeedant actions against insects, *Azadirachta indica* also exhibits growth-regulating, ovipositor repellent, fecundity suppression, and sterilization activities that are utilized to control ectoparasites (Ponnusamy *et al*. 2016) [130]. Tick control in numerous animals was demonstrated by a herbal formulation containing *Tinospora cordifolia*, *Cucumis sativus*, *Azadirachta indica*, *Vitex negundo*, and *Acorus calamus* (Nimbalkar *et al*. 2020) [112]. By burning the leaves of *Vitex negundo*, the smoke produced is useful in controlling ticks and other ectoparasites (Kekuda and Mahalakshmi, 2020) [74]. In some South African villages, *Aloe ferox* is used as tick repellent (Moyo & Masika, 2009) [106]. In Zimbabwe, ectoparasites are managed with *Cissus quadrangularis*, *Lippia javanica*, *Psydrax livida*, and *Aloe species* (Nyahangare *et al*. 2015) [115]. For the treatment of wounds, dyspepsia, and ectoparasite control, *Acorus calamus* leaves are made into a decoction and placed on the affected skin part (. The leaves of *Coriandrum sativum*, *Chlorophytum arundinaceum*, *Albizia lebbeck*, and *Ocimum gratissimum* are utilized for the control of ectoparasites, as well (Bhat *et al*. 2023) [22].

5. Insecticidal effect of botanicals

Due to environmental contamination, insect resistance development, residual effects, and lack of activity specificity, the use of chemical insecticides to address insect problems has deteriorated into a serious global issue. Green pharmaceutics has come about as a result of the growing environmental pollution worries linked to various synthetic (insecticide) chemical wastes. Farmers use the burning of the leaves of specific plants to ward off insects (Hammad *et al*. 2011) [60]. A key ingredient that gives plants their insecticidal effect has been discovered as roemerine, an aporphine alkaloid (Magadula *et al*. 2009) [93]. Significant insecticidal efficacy against sheep and goat mange mites was found in *Eucalyptus globulus* essential oil in a dose-dependent manner. To guard against mosquitoes and other dangerous arthropods, Eucalyptus oil has shown great effectiveness as a natural insect repellent (Gemechu *et al*. 2019) [51]. Some plants have shown acaricidal action in different parts of the world, such as *Tephrosia vogelii* Hook. (Gadzirayi *et al*. 2009) [45] and *Azadirachta indica* A. Juss. (Benavides *et al*. 2001; Webb & David, 2002) [20, 162]. *Stylosanthes scabra*, & *Solanum dasyphyllum* (Van Puyvelde *et al*. 1985) [159], *Cleome gynandra* L. (Malonza *et al*. 1992) [97], and *Melinis minutiflora* P. Beauv. (de Barros & Evans 1989) [33] are a few examples of plants with similar characteristics. Using data from previous assessment of ethnobotanical knowledge (Stevenson *et al*. 2010) [151], Madzimure *et al*. (2011, 2013) [91-92] validated the acaricidal effects of *Lippia javanica* leaves (Burm. f.), *Solanum incanum* L. fruits, and *Strychnos spinosa* Lam. fruits in Zimbabwe. Tick populations on cattle were decreased by the plants' unprocessed water extracts (Nyahangare *et al*. 2015) [115].

Insecticidal action has been demonstrated in the roots of *Cucumis dipsaceus* and the leaves of *Acokanthera schimperi* (Damtew *et al*. 2012) [30]. In comparison to the favourable reference medications (Diazinon), Negessa *et al*. (2011) [109] found that *Cymbopogon citrus* oil had good activity against *Sarcoptes scabiei var. caprea* mange mites on naturally affected goats. Additionally, *Cymbopogon citratus* essential oil exhibits stronger insecticidal action against sheep ked than the positive control (Diazinon), according to Gemeda *et al*. (2014) [52]. On rabbits and goats, other plant substances, such as linalool, also demonstrated acaricidal efficacy against the psoroptes mite. Additionally, *Pediculus humanus capitis* was resistant to the insecticidal effects of linalool and cinnamyl acetate (Yang *et al*. 2004) [67]. According to Zeneida *et al*. (2015) [168], medicinal plants with acaricidal qualities also have the advantages of being relatively non-toxic to mammals and low environmental toxicity. These findings support the idea that using herbal acaricides can be a more effective and safer alternative to conventional mange treatments in domestic animals (Gemechu *et al*. 2019) [51].

6. Ethnobotanicals in insect pest control

Agricultural crops are frequently exposed and put at risk by insect pests, which affects their growth and quality over time (Archana, 2014; Donatelli *et al*. 2017) [13, 36]. According to Sindhu *et al*. (2010) [147], plants constitute an essential part of both traditional remedies and insecticides. Plant-based therapies were widely used for pest management prior to the development of synthetic pesticides (Mahmood *et al*. 2016) [96]. Numerous crop pests have been managed using plants that contain bioactive compounds (Thiruppathi *et al*. 2010) [154]. Numerous studies using known and untapped plant species with pesticidal properties have been carried out (Erenso and Berhe, 2016) [46]. Pyrethrum (*Tanacetum cinerariifolium*) flowers have been successfully employed as sources of safe pesticides for the management of insect pests (Sarwar, 2015) [141]. Examples of plants that are sources of commercially available botanical pesticides include pyrethrum (*Tanacetum cinerariifolium*), neem (*Azadirachta indica*), sabadilla (*Schoenocaulon officinale*), tobacco (*Nicotiana tabacum*), and ryania (*Ryania speciosa*) (Arnason *et al*. 2012) [14]. Due to their various methods of action, botanical pesticides have been demonstrated to effectively manage a variety of agricultural pest species, frequently outperforming synthetic chemicals (Sola *et al*. 2014; Benelli *et al*. 2019; Stefanidesova *et al*. 2017) [149, 21, 150]. A botanical pesticide can repel insects, keeping them away from treated materials by stimulating their olfactory receptors (Isman, 2006) [66]. This protects crops while having a low influence on the ecology. The essential oils of *Ziziphora tenuior*, *Myrtus communis*, *Achillea wilhelmsii*, and *M. piperita* have been found by Ghavami *et al*. (2017) [54] to exhibit repelling properties against insect pests and even human fleas. Due to the essential oils' repellant action on *Tribolium confusum*, showed the effectiveness of *M. piperita*, *R. officinalis*, and *Coriandrum sativum* oils for application in organic food protection from insect pests. According to Zhang *et al*. (2017) [169], T. *castaneum* and *L. serricorne* adults are two storage pests that these six Zanthoxylum species' essential oils have been shown to repel. These essential oils come from *Z. armatum*, Z. *dimorphophyllum*, *Z. dimorphophyllum* var. s*pinifolium*, *Z. piasezkii*, *Z. stenophyllum*, and *Z. dissitum*. The effects of *Cymbopogon citratus* and *Thymus minuta* essential oils on the sandfly *Phlebotomus duboscqi* were demonstrated by Kimutai *et al*. (2017) [76]. Tannins, saponins, flavonoids, steroids, and alkaloids-all phytoconstituents-found in the leaf extract of *Khaya senegalensis* caused *Dinoderus porcellus* mortality (Loko *et al*. 2017) [88]. Granary weevil adults were successfully fumigated and killed by *Lavandula angustifolia* essential oil. Additionally, granary weevil orientation to a desirable host substrate can be disrupted by its strong repellent function (Germinara *et al*. 2017) [53].

7. Medicinal plants and antioxidant defense systems

There is a huge diversity of minerals and phytochemicals found in medicinal plants. In addition to their mineral components, these plants' actions are principally centred on reducing oxidative stress (Shakoor *et al*. 2021) [18]. Food antioxidants are notably important for maintaining health and vigour (Manivannan *et al*. 2016) [98]. To support claims made in folklore, Pawa *et al*. (2011) [128] conducted pharmacological investigations on *Sida cordifolia* for anthelmintic and antioxidant activity. The plant's aqueous and ethanolic extracts demonstrated anthelmintic and antioxidant properties. Due to the presence of phytoconstituents like flavonoids (5,7-dihydroxy-3-isoprenyl flavone and 5-hydroxy-3-isoprenyl flavone), phenolic compounds, and alkaloids (Asparagin, ephedrine, vascicinone, vascinol, and pseudoephedrine), the ethanolic extract produced more significant results. *Detarium microcarpum* has a wealth of antioxidant characteristics, according to various studies (Hassanin *et al*. 2018; Meda *et al*. 2017) [62, 103], and it is effective in treating several disease conditions, including diabetes, cancer (Ngulde *et al*. 2015) [111], helminthiasis (Haladu *et al*. 2020) [59], and others. At 10 mg/ml, *D. microcarpum* demonstrated strong antibacterial activity against *Salmonella paratyphi*, *Bacillus subtilis*, *Staphylococcus aureus*, *Candida albicans*, *Pseudomonas aeruginosa*, and *Escherichia coli* (Semde *et al*. 2018; Ebi &

Afieroho, 2011) [143, 41]. Seeds of *Abrus precatorius* decrease ROS formation in hepatocarcinogenesis and increase the antioxidant defence system; protecting the kidney from alcohol-induced parenchymal injury (Pal *et al*. 2009; Kartik *et al*. 2010) [124, 73]. *Alpinia galanga* rhizomes are used to treat indigestion, bronchial catarrh, rheumatism, ulceration, helminth infection, dementia, and fever due to their rich radical scavenging activity, reducing properties, metal ion chelating, and beta carotene bleaching properties (Mahae and Chaiseri 2009; Wong *et al*. 2009) [94, 164]. Roots, bark, and fruit of *Berberis aristata* have been used successfully to treat skin conditions, jaundice, and eye infections attributable to their radical scavenging characteristics (Singh and Kakkar 2009; Andola *et al*. 2011) [148, 12]. According to Kucukboyaci *et al*. (2010) [79], lignan derivative chemicals in *Taxus baccata* (Leaves, Bark) demonstrated antioxidant, anti-inflammatory, antinociceptive, anti-ulcerogenic, and cytotoxic effects. Due to its potent antioxidant and free radical scavenging qualities, the roots of *Valeriana jatamansi* have been used to treat ulcers, wounds, epilepsy, dyspepsia, flatulence, colic, constipation, jaundice, dry cough, asthma, seminal weakness, and neurological problems (Kalim *et al*. 2010; Bhatt *et al*. 2012) [71, 23]. According to studies conducted by Ganie *et al*. (2011) [49], a *Podophyllum hexandrum* aqueous extract can shield kidney and lung tissue from CCl4-induced oxidative stress. According to studies (Mubashir *et al*. 2020; Shekarchi *et al*. 2012) [107, 145], rosmarinic acid isolated from *Ocimum basilicum* exhibits antioxidant, anti-inflammatory, and neuroprotective properties.

8. A few notable applications of phytotherapy

A conventional strategy used to address women's health issues is called ethnogynecology (Aziz *et al*. 2018) [17]. Women continue to favour traditional remedies for a variety of reasons in different parts of the world, including Latin America, Africa, and Asia (van Andel *et al*., 2014) [158]. *Withania somnifera* is used as a uterine tonic and has been demonstrated in studies to increase semen output as well (Aziz *et al*. 2018) [17]. The pharmacological effects of *W. somnifera* are thought to be mediated by steroidal lactones and the basic withanolides, withaferin A and D (Umadevi *et al*. 2012) [157]. Since ancient times, *Nigella sativa* seed has mostly been used as an abortifacient to treat sexual abnormalities (Iqbal *et al*. 2010) [65]. Clotrimazole vaginal cream combined with *N. sativa* capsules was discovered to be more effective than clotrimazole vaginal cream alone. In order to cure *Candida albicans* vaginitis, *N. sativa* pills are advised (Fard *et al*. 2015) [42]. A widely used traditional medicine in humans is *Asparagus racemosus* root, which is supplemented from the last trimester of pregnancy to the first few weeks after birth to improve milk quality, boost foetal and maternal immunity, and tone the reproductive system and promote reproductive health (Kumar *et al*. 2010) [82].

Cirrhosis is one disease that the hepatitis C virus (HCV) can lead to (Karoney & Siika, 2013) [72]. Several African medicinal plants, have been used to cure liver conditions (Galani *et al*. 2015) [48]. There have been reports of antiviral activity in the *Detarium microcarpum* fractions, for instance; the Hepatitis C virus (HCV) was specifically suppressed by the active component of MTH-1700 (Olugbuyiro *et al*. 2009) [119]. The use of plants in conventional cancer treatments, such as *Securidaca longipedunculata*, and *Andira inermis subsp. rooseveltii*, *Pterocarpus erinaceus*, *Carissa edulis spp.*, *Detarium microcarpum*, *Cassia sieberiana*, etc., has been supported by several scientific studies (Ngulde *et al*. 2015) [111]. According to Mahmood *et al*. (1993) [95], flavones in the methanol extract of *D. microcarpum* can significantly suppress HIV-1 and HIV-2 Acetylcholinesterase (AChE) was demonstrated to be inhibited by clerodane-type diterpenes that were extracted from *D. microcarpum* fruits by Cavin (2007) [26]. The best method for treating Alzheimer's disease symptoms at the moment is AChE inhibition. One of the substances, 2- oxokolavenic acid, was ten times more potent than galanthamine, a treatment for Alzheimer's disease that has been therapeutically successful. *Annona senegalensis* has been reported to be effective in treating epilepsy, and several researches has supported its anticonvulsant claims (Konate *et al*. 2012; Dongmo *et al*. 2014; Okoye *et al*. 2013) [77, 37, 118]. *Annona senegalensis* has been used to also treat malaria in Guinea. As evidenced by the increased RBC, Hb, and PCV levels, jackfruit (*Artocarpus heterophyllus*) diets have some anti-anemic characteristics (Agiang *et al*. 2017) [8]. According to Yakubu *et al*. (2017) [165], the ethanolic extract of *Hymenocardia acida* leaves has a modestly ameliorative impact on the toxicity caused by aluminium chloride.

9. Conclusion

This review is an update of previously published scientific data that supports folkloric uses of plant extracts and traditional knowledge in production, management of reproductive problems and diseases, control of parasites, insects and insect pests in agriculture. These days, herbs are making a comeback. This is mostly caused by increasing microbial resistance, cost, environmental degradation, and worries about the safety of synthetic chemicals and pharmaceuticals. An effective option for future remediation is ethnobotanical plants. Hence consistent research and update of findings in ethnomedicinal plant studies remain key to developing standard guideline for their application while providing reference for further studies on the subject.

Authors contribution

MYP conceived the study, reviewed and edited the manuscript. OM, AFO & OIM wrote various aspects of the manuscript. All authors read and approved the final manuscript for publication.

Informed Consent Statement

Not applicable

Conflicts of Interest

The authors declare no conflict of interest

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