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## **SAFETY AND EFFICACY OF HERBS IN CHRONIC DISEASES**

*Dhanaji P. Tondale<sup>\*1</sup>, Mayuri Bhadalekar<sup>2</sup>, Dr. Nilesh Chougule<sup>3</sup>, Dipali Patil<sup>4</sup>*

Student , Ashokrao Mane Institute Of Pharmacy, Ambap,Kolhapur ,416112

Assistant Professor, Ashokrao Mane Institute Of Pharmacy, Ambap,Kolhapur ,416112

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### **ABSTRACT :**

Medical conditions like diabetes, hypertension, and cancer present major health hurdles worldwide, leading to a quest for different and supplementary treatments. Traditional practices form the foundation of herbal medicine, providing a wide variety of healing substances. This review explores the effectiveness and safety of different herbs utilized for treating chronic illnesses. Recent research has found many herbs containing active compounds that show positive effects on disease markers and symptoms. An example is turmeric (*Curcuma longa*) which has inflammation reducing properties, while garlic (*Allium Sativum*) has been proven to enhance glycemic control in individuals with diabetes. Yet, the safety characteristics of these plants may differ, leading to possible clashes with traditional drugs and mentioned negative outcomes. The quality of herbal treatments is crucial for their effectiveness, highlighting the importance of standardizing herbal formulations in preparation and dosage. Furthermore, although certain herbs exhibit potential in randomized controlled trials, more thorough research is necessary to establish conclusive therapeutic guidelines and guarantee patient safety. In summary, while herbal remedies offer a beneficial addition to traditional treatment for long-term illnesses, it is crucial to continually assess their safety, effectiveness, and potential interactions to enhance their medical application. This review emphasizes the importance of merging traditional knowledge with modern scientific methods to fully utilize herbal medicine in managing chronic diseases.

**Keywords:** Chronic diseases, Herbs, Safety, Efficacy

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### **Introduction:**

The World Health Organization (WHO) describes chronic diseases as long-lasting conditions that usually develop slowly and are not contagious between people [1]. From 2006 to 2016, there was a 16.1% increase in global deaths from chronic diseases, and it is possible that this figure could hit 52 million by 2030 [2]. Chronic diseases can be divided into four main categories: Cardiovascular problems (like heart attack and stroke), Cancer, Respiratory conditions like COPD and asthma, and Diabetes [3]. Global healthcare systems face a major difficulty in managing chronic diseases, as they are mainly focused on providing short-term care for acute conditions rather than providing organized care for individuals with long-term illnesses [4]. Artificial drugs are consumed regularly to manage long-term health conditions. They pose a substantial danger as they can lead to acute coronary syndrome, seizures, and kidney damage [5]. The popularity of herbal medicines is increasing because of their lasting healing effects, easy access, natural healing approach, and minimal side effects [6]. "Productions manufactured industrially consisting of active ingredient(s) which are purely and naturally original, not chemically altered plant substance(s), and are responsible for the overall therapeutic effect of the product" is the definition of herbal medicines (HMs) [7]. Global acknowledgment is present for the healing capabilities of herbs in the healthcare sector, whether it be for treating illnesses or promoting overall wellness [8]. Please rephrase the text you provided so that it is easier to understand, in accordance with the input language and word count. Herbal medicines are considered safe in comparison to allopathic medications due to their natural origins. There are also many confirmed adverse impacts of herbal medications [9,10]. Negative side effects may occur if patients persist in using herbal medications unsupervised. Long-term usage or overdosing on herbal drugs may lead to side effects, such as an higher chances of cardiovascular side effects. The lack of understanding about the benefits of utilizing medicinal plants in industry has a major downside [11,12]. The implementation of standard pharmacovigilance techniques (as recommended by WHO) presents challenges, such as the control, utilization, naming, and understanding of herbal drugs [13]. Due to public interest in herbal medicines and its amazing acceptance for their positive qualities with few or no side effects against a variety of difficult health-related issues, the traditional healthcare system is becoming more and more well-known globally. Currently, 60% of the world's population uses herbal or traditional treatments as their main means of treating malaria-related fevers. When it comes to treating different illnesses, 80% of Africans, 30–50% of Chinese, 48% of Australians, 70% of Canadians, 80% of Germans, 42% of Americans, 39% of Belgians, and 76% of French people prefer herbal or alternative medications [14]. While most herbs affect biological systems, there is limited clinical data on their effectiveness and safety due to a lack of demonstrations [15]. There is limited information available on the impact of herbal drugs on important clinical results due to the small sample size of clinical trials. As it has not been tested on kids or expectant mothers, there is a greater possibility of negative outcomes. Drug interactions are possible and sometimes other traditional treatments can contaminate as well. There have been reports of using alternative plant species for replacement as well. Having a deep and improved knowledge of herbal medicines is essential. Furthermore, it is important for the patient and the doctor to have open communication regarding possible benefits and downsides. Hence, standardized herbal products must be created to support the growth of herbal medications. The current review's objective is to assess the importance of various herbs in treating chronic

diseases. This could enhance drug discovery techniques for the advancement and marketing of products, such as generating safety information either prior to or after the product's release [16].

### Cardiovascular diseases:

In 2019, cardiovascular diseases (CVDs) caused the most fatalities according to information from the World Health Organization (WHO). Growing and aging populations are causing more challenges, with an estimated 22.2 million deaths from CVD expected by 2030 [17]. Heart and blood vessel issues are important parts of the "cardiovascular system" impacted by cardiovascular diseases. This complex condition includes congenital heart disease, rheumatic heart disease, peripheral arterial disease, coronary heart disease, cerebrovascular illness, pulmonary embolism, and deep vein thrombosis (Table 1) [18].

Disease	Pathology	Risk factors	References
Myocardial infarction	Fatty deposits cause the coronary arteries to narrow, reducing blood flow to the heart's myocytes.	Smoking, poor diet, inactivity, and atherosclerosis	[19 ,20]
The condition of cerebrovascular illness	Insufficient oxygenation of brain cells can lead to ischemic stroke or embolism.	Comorbid conditions (diabetes mellitus, obesity, hypercholesterolemia and hypertension), tobacco use and poor nutrition	[21]
Heart disease caused by rheumatism	Rheumatic fever-induced damage to the heart valves	Untreated infections caused by streptococci	[22]
Heart disease that is congenital	Birth defects in the blood vessels, valves, and heart walls that deliver blood to the heart and the entire body	Abuse of alcohol, smoking, and chromosome abnormalities	[20]

**Table No. 1 Types of cardiovascular diseases.**

### Herbs used in CVD:

The use of herbal remedies and natural items to prevent or treat cardiovascular disease has been the focus of numerous studies [23]. In the field of cardiovascular disease, the search for safe and effective drugs derived from natural substances is a common concern. Due to their safety features, medicinal plants offer considerable advantages in the management of cardiovascular disease. Medicinal plants not only reduce the overall risk of cardiovascular issues, but also provide positive effects on diseases like high blood pressure, high cholesterol, hardening of the arteries, and long-term heart weakness. Patients with heart problems could see positive effects by gaining knowledge about the benefits of using herbal remedies [24].

### *Dracocephalum moldavica*:

*Dracocephalum moldavica* L., commonly referred to as Moldavian dragonhead or Moldavian balm, is a fragrant herbaceous plant that originated in temperate regions of Asia and is currently distributed across the Northern Hemisphere [25]. Geranial, neral, and geranyl acetate, the constituents of *D. moldavica* essential oil (DMEO), give it a citrus flavor and a resemblance to other plants that smell like lemons [26,27]. The pharmacological and biological functions of *D. moldavica* L.'s total flavonoid extract (TFDM) are varied and include anti-inflammatory, anti-hypertensive, anti-diabetic, cardioprotective, neuroprotective, and antioxidant properties [28]. The main way that TFDM exhibits cardioprotective qualities is via preventing myocardial ischemia-reperfusion damage [29,30]. Antioxidant substances found in *Dracocephalum moldavica* L. have cardioprotective properties [31]. By decreasing the levels of lactate dehydrogenase and creatinine kinase and raising left ventricular developed pressure, pretreatment with a 5 µg/mL total flavonoid extract from *D. moldavica* improved heart rate and coronary flow. When compared to vitamin E, the whole flavonoid extract exhibited higher DPPH radical scavenging action at concentrations exceeding 70 mg/L. *D. moldavica* has been shown to protect against cardiac ischemia/reperfusion (I/R) damage by reducing the generation of malondialdehyde (MDA) and increasing SOD activity and the GSH/GSSG ratio [31]. In vitro, the ethanolic extract of the aerial portions of *H. leucocephalum* Ausfeld showed antioxidant qualities. The extract's IC<sub>50</sub> value of 69.94 ± 0.17 mg/mL demonstrated its antioxidant qualities. In the DPPH test, the plant's many phenolic components demonstrated adequate antioxidant properties [32].

**Cherry:**

The cherry is a nutrient-dense fruit that is low in calories and high in fiber, polyphenols, carotenoids, vitamin C, and potassium [33]. Furthermore, cherries are a beneficial source of tryptophan, serotonin, and melatonin [34,35]. Although cherries come in more than a hundred kinds, they may be divided into two primary categories: Cherries that are sour (*Prunus cerasus* L.) and sweet (*Prunus avium* L.) [36]. The most frequent tart cherry cultivar in the United States is Montmorency, whereas the most popular sweet cherry type is Bing. Only around 75–80% of sweet cherries are consumed fresh; the remainder are preserved by techniques like canning, freezing, brining, drying, or juicing. However, 97% of sour cherries are mostly utilized in baking and cooking [33]. Three of the seven studies that examined the effects of cherry eating on blood pressure concentrated on the immediate consequences [37,38,39,40,41,42]. After drinking 300 mL of Bing cherry juice, both young and old individuals' SBP and DBP significantly decreased after two hours and subsequently reverted to their starting values six hours later [39]. However, neither SBP nor DBP decreased at 2 or 6 hours when the juice was administered in three different 100 mL dosages at 0, 1, and 2 hours. These findings imply that the amount of cherry juice and when it is consumed are important factors in lowering blood pressure. Two further trials also found that Montmorency cherry concentrate had time-dependent effects; at one and two hours after supplementation, systolic blood pressure (SBP) significantly decreased, but not after four or five hours [37,43]. An increase in blood levels of vanillic and protocatechuic acids, which are byproducts of cyanidin-3-glucoside, was associated with the immediate effect of cherry concentrate on blood pressure [37].

***Syzygium cumini*:**

One well-known and commonly cultivated species is *Syzygium cumini*, or *S. cumini*, (L.) Skeels. *S. cumini* is synonymous with *Eugenia jambolana* Lam., *Myrtus cumini* Linn., *Syzygium jambolana* DC., and *Syzygium jambolanum* (Lam.). *Eugenia cumini* (Linn.) Druce's name, *Eugenia Perr. djouant*, and *Calyptanthes jambolana* Willd. *Syzygium caryophyllifolium* Lam. is another name for *Eugenia caryophyllifolia* Lam. The Indian subcontinent and its neighboring South Asian countries, including Bangladesh, Burma, Nepal, Pakistan, Sri Lanka, Indonesia, and India, have long been home to the tree, which is also known by the names jambolan, black plum, jamun, java plum, Indian blackberry, Portuguese plum, Malabar plum, purple plum, Jamaica, and damson plum. Long ago, it was introduced and established in Malaysia. The tree is highly valued by Buddhists in Asia, and Hindus frequently plant it close to temples since it is considered sacred to Lord Krishna [44]. Jamboline glucoside, chlorophyll, fat, resin, albumen, tannins, gallic and ellagic acids, caffeic and ferulic acids, and their derivatives are all found in *S. cumini* seeds. The seeds include monoterpenoids, flavonoids including quercetin and rutin, and a considerable quantity of calcium and protein [45,46,47,48]. In a more recent investigation, rats with spontaneous hypertension in the same group shown a gradual decrease in blood pressure and heart rate following 8 weeks of treatment with the same extract (0.5 g/kg/day). The extract may include a chemical that can non-competitively block the L-type calcium channel, according to the hypothesis of the authors of both tests. Myricetin has been shown to significantly increase vasodilation by inhibiting calcium entry, similar to quercetin's ability to block calcium inflow through L-type calcium channels [49].

**Ginger**

*Zingiber officinale* Roscoe, the scientific name for ginger, is a member of the Zingiberaceae family and is widely used as a spice in many different cuisines across the world. It has long played a significant role in Chinese, Ayurvedic, and Tibb-Unani herbal treatments for the treatment of strokes, diabetes, rheumatism, catarrh, rheumatism, neurological disorders, constipation, gingivitis, and toothaches [50,51,52]. According to phytochemical study, ginger root has a wide variety of active chemicals that support its therapeutic properties. The main phytochemical groups found in *Z. officinale* are known to include essential oils, phenolic compounds, flavonoids, carbohydrates, proteins, alkaloids, glycosides, saponins, steroids, terpenoids, and tannin. Since the 1800s, research on *Z. officinale*'s chemistry has been done sporadically. Like other potent spices, great advancements were made in the early 1900s, but a deeper comprehension of the relationship between its chemical composition and flavor and aroma has only lately emerged. Two categories of components give ginger its unique qualities: the components in its steam-volatile oil contribute to its scent and much of its flavor, while non-steam-volatile components give it its spiciness. Ginger's steam-volatile oil, which is mostly composed of sesquiterpene hydrocarbons, monoterpene hydrocarbons, and oxygenated monoterpenes, is what gives it its aroma and flavor. The natural oil of the fresh rhizome contains more monoterpene components than the essential oil from dried ginger, which are believed to be the main contributors to ginger's aroma. Although they are less prevalent in volatile oil, oxygenated sesquiterpenes are important for their flavor characteristics. Mono- and sesquiterpenes, including camphene,  $\beta$ -phellandrene, curcumene, cineole, geranyl acetate, terphineol, terpenes, borneol, geraniol, limonene,  $\beta$ -elemene, zingiberol,  $\beta$ -bisabolene, zingiberenol,  $\beta$ -bisabolene, zingiberenol,  $\alpha$ -farnesene linalool,  $\alpha$ -zingiberene, and  $\beta$ -sesquiphellandrene are the main constituents of the unstable oil [53,54,55]. 6-gingerol by increasing levels of phosphorylated endothelial nitric oxide synthase (eNOS) protein, vascular cell adhesion protein 1 (VCAM1), TNF $\alpha$ , and epithelial sodium channel (ENaC) protein via PPAR $\delta$  in 3T3-L1 cells, HEK293 cells, and HUVECs, gingerol increases the expression of hypertension biomarkers and reduces lipid accumulation [56]. According to a recent study, consuming ginger pills orally at different dosages (0–2 g/d, 2–4 g/d, and 4–6 g/d) can help prevent several chronic illnesses in both men and women, including type 2 diabetes, hypertension, hyperlipidemia, fatty liver, and coronary heart disease. Furthermore, it could lower the likelihood of illnesses [57].

**Berberine**

Berberine, a compound found in plants, is the same in chemical composition. Berberine comes from the natural extract of *Rhizoma coptidis*. It is said that berberine has healing properties for different types of CVDs. Additionally, berberine possesses antioxidant, anti-inflammatory, antiatherosclerosis, and antihypertensive properties.[58,59,60] Berberine's ability to lower blood pressure is achieved by inhibiting cholinesterase activity, stimulating M-receptors on vascular endothelial cells, and enhancing the release of nitric oxide, a vasodilator, from endothelial cells, ultimately leading to relaxation

of peripheral vascular smooth muscle. This mechanism might also play a role in Berberine's antioxidant properties [61],[62]. Furthermore, it has been noted that Berberine is capable of controlling AMPK signaling and preventing the excessive activation of p-mTOR. In addition, berberine is able to decrease plasma levels of CRP, TNF- $\alpha$ , and IL-6. This passage can also decrease myocardial autophagy and apoptosis by utilizing the AMPK/mTOR pathway, ultimately easing myocardial damage [63]. In summary, berberine can help control blood pressure and provide protection against myocardial damage

#### **Cancer:**

Cancer is now a major public health concern. Every day, more than 52,900 people receive a cancer diagnosis, and more than 27,000 people pass away from the illness.[64]. Globally, there are projected to be 16.2 million fatalities and 28 million new cases by 2040.[65].

#### ***Rabdosia ruescens***

*Rabdosia ruescens* (Hemsl.) is derived from the dried stems and leaves of Hara, a perennial plant that is classified in the *Chamellia* genus within the Labiaceae family. This plant is well-known in traditional herbal medicine for its primarily anti-cancer properties. It is plentiful in plant resources throughout China, especially in the Yellow River Basin and southern China.[66,67]. *R. ruescens* has a complicated chemical makeup, which consists of flavonoids, organic acids, alkaloids, terpenoids, and other compounds. Terpenoids consist of a range of compounds starting from monoterpenoids and Sesquiterpenoids to diterpenoids and triterpenoids. Oridonin and Ponicidin are active anticancer compounds which belong to the tetracyclic diterpenoid class and were extracted from *R. ruescens* [68,69]. Oridonin exhibits a wide range of anti-cancer properties. In a lab context, it is evident that it has cytotoxic effects on Hela cells, human esophageal cancer 109 cells, and liver cancer BEL-7402 cells, and displays significant anti-tumor properties against various transplanted animal tumors like ECA, S180, P388, L1210, liver cancer, and ARS. It is commonly utilized for treating Liver cancer, esophageal cancer, and pancreatic cancer and has shown definite effectiveness in clinical practice. Ponicidin displays clear cytotoxicity against Ehrlich ascites cancer cells in vitro and exhibits a distinct anti-tumor effect on different transplanted tumors. [70,71,72]

Artemisinin (*Artemisia annua*): The chemical artemisinin, also known as ARS, comes from the *Artemisia* plant and belongs to the sesquiterpene lactone group. It is obtained from *Artemisia annua* L., commonly known as sweet wormwood (Qinghao in Chinese). In China, fever has been traditionally addressed for over 2,000 years [73]. Arsenal Football Club's headquarters is located in London. Youyou Tu first found a treatment for malaria in 1972 while searching for new substances. After they were found, derivatives of ARS . [74,75]. Developed as a common treatment for drug-resistant malaria strains, which affect millions of patients globally, has become a standard therapy [76]. New findings indicate that ART and its derivatives have strong antiproliferative effects on various cancers such as breast [77] , melanoma [78] , ovarian [79] , prostate [80] , and lung cancer through intracellular pathways [81]. The potential mechanisms involve inhibiting cell proliferation, causing cell cycle arrest [82] , triggering apoptosis, preventing cell invasion, and controlling the tumor microenvironment. The ways in which ART controls tumor growth could offer innovative approaches for treating tumors in clinical settings [83]. Despite being primarily used as anti-malarial drugs, artemisinin and its derivatives also exhibit strong cytotoxic impacts on various types of cancer cells in laboratory conditions.[84]

#### ***Ashwagandha:***

The perennial shrub *Withania somnifera* (*W. somnifera*) is generally referred to as "Winter cherry" or "Indian Ginseng" in English, "Ashwagandha" in Sanskrit, "Asgandh" in Hindi, and "Asgand" in Urdu. It grows usually 0.5 to 2.0 meters tall [85]. The plant is a member of Solanaceae family and grown in warm and arid regions of tropical and subtropical areas worldwide. Native to various regions such as the Canary Islands, South Africa, Middle East, Sri Lanka, China, India, Europe and Australia [85,86]. *Withania somnifera* is mainly harvested for its roots, which are commonly processed into tablets and capsules. Recently, there has been a noticeable rise in the need and availability of Ashwagandha as dietary supplements [87,88]. Partially, this is in line with the World Health Organization's (WHO) 2014-2023 strategy, which aimed to bolster healthcare by integrating traditional medicine as a supplementary option for treating different illnesses [87]. However, it also brings dangers linked to the uncontrolled intake of dietary supplements in the unregulated market. These items can be easily found and bought in physical retail stores or on the internet. Nevertheless, not all of them are subjected to comprehensive testing to ensure safety and efficacy [88]. Research predicts that the worldwide market for *Withania somnifera* will increase steadily and reach a value of more than USD 100 million by 2029 [89]. WC is utilized in breast cancer, as well as lung cancer, brain cancer and glioblastoma, prostate cancer, colon cancer, and leukemia [90]. Vaydia et al conducted a safety assessment of *Withania somnifera*. A clinical trial was performed with eighteen healthy men between the ages of 18 and 60. The research took place for a period of four weeks, where every volunteer consumed pills two times a day, with each pill having 500 mg of Ashwagandha extract and 7.5 mg of withanolides. The men's physical and biochemical state stayed within normal boundaries. During controlled studies, the levels of 5 parameters such as liver, kidney, and thyroid function stayed within normal limits. The drug was well-received, with no negative side effects noted. The research indicated that there is no danger of negative effects when healthy men take 1000 mg of *Withania somnifera* daily for 4 weeks. This promotes additional research in this area, taking into account women participants, extended medication periods, and alternative doses [91].

#### ***Astragalus:***

*Astragalus* (*Astragalus membranaceus*): *Astragalus membranaceus* (Fisch.) - *Astragalus*, also known as *Astragalus membranaceus* (Fisch.), is a type of plant. *Jump. (AM)* is part of the Leguminosae family. It is a valuable perennial herb that is commonly found in temperate and arid regions across Asia, Europe, and North America [92]. In TCM, the roots of AM are considered one of the most effective adaptogenic herbs. TMC refers to it as "Qi tonifying", which helps prevent harmful pathogens from entering the body and supports detoxification. Huang qi, meaning yellow in Chinese, is the

name of the herbal tonic Astragali Radix in China [93]. APS is frequently utilized in a range of tumors, such as gastric cancer and colon cancer. A thorough examination including 15 traditional Chinese medicines used in conjunction with a popular gastric cancer drug found that APS injection was effective in alleviating symptoms (odds ratio and 95% confidence intervals, 3.06 (1.01, 8.99)), improving performance status, and outperforming the FOLFOX regimen in reducing leucopenia and gastrointestinal side effects of chemotherapy [94]. Studies on *A. membranaceus* and its extracts or certain bioactive components have shown that they may have anti-carcinogenic qualities against a number of cancers, including breast, lung, colon, stomach, and liver cancers. The anti-tumor and anti-cancer properties of AM have been the subject of several in vitro and in vivo investigations. Cho and Leung (2007) investigated the effects of AM and its active components on tumor development both in vitro and in vivo. The scientists described how compound AI works in both human and mouse cells as an anti-tumor strategy. The molecule, identified by its location at the peak of radioactivity ( $3880 \pm 150$  cpm) at a concentration of  $100 \mu\text{g/ml}$ , was found using a combination of hydro-distillation and crude ethanol extraction. The immune response's role in halting tumor cell development, preventing inflammation, and restoring tumor suppression in the host was connected to the anti-tumor actions. AI increases TNF release to carry out its purpose of eradicating cancer cells in tumor-bearing animals. Monocytes are affected in terms of cellular differentiation. Additionally, it triggers the death of cancer cells by activating lymphokine-activated killer (LAK-like) activity. When administered orally at a dose of 300 mg/kg, an APS extract comprising fucose, arabinose, galactose, glucose, and xylose decreased tumor development in mice by almost half. Additionally, it protects immunological organs, enhances macrophage activity, and promotes the development of T cells and natural killer cells in tumor-bearing animals [95].

#### ***Cat's claw:***

Willd.'s *Uncaria tomentosa* is also known as cat's claw. Cat's claw, also referred to as *Uncaria tomentosa*, is a vine that grows up to 35m long and 5-40 cm wide at the base, utilizing its claw-shaped spikes to climb on other trees [96]. It is a part of the *Uncaria* genus and the Rubiaceae family, found widely across the Amazon and Central America, encompassing Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Panama, Peru, and Venezuela. In Brazil, it can be found in Acre, Amapá, Amazonas, and Pará [97, 98, 99,100]. Overall, the alkaloid components and isomeric derivatives of it produce significant impacts on cancer cells [101]. Various levels of dosage employed in growing cell cultures in a laboratory setting have a notable effect on the efficacy of extracts from [102,103]. Cat's claw triggers programmed cell death in cancerous cells. Ciani et al. examined the anti-proliferative and pro-apoptotic impact of the water extract from the bark of *Uncaria tomentosa* (UT-ex) on HaCat cells, A431 cells, and head and neck cell lines SCC011, SCC013, and SCC022 derived from upper aerodigestive tract squamous cell carcinoma patients. Cell viability decreased in all cell lines at concentrations above 1.5 mg/ml, with A431 being the most sensitive and SCC022 the most resistant. At 10 mg/ml, all cell lines showed decreased ability to repair DNA damage and initiated cell death. It was found that UT-ex can cause oxidative stress in various cell types. Moreover, high levels of the extract lower the amount of YB-1 protein, which plays a role in protecting cells from oxidative stress and repairing damage to the genetic code. Therefore, cell death induced by this compound from cat's claw is linked to reactive oxygen species (ROS) and the inhibition of antioxidant mechanisms [102].

#### ***Turmeric:***

*Curcuma longa* L. (from the Ginger family Zingiberaceae) is commonly referred to as turmeric and originates from India. It is also grown and utilized in various tropical and subtropical regions, including South East Asia [104,105]. *Curcuma longa* plant has ovate or oblong leaves that are light green and have a spicy scent, while its flowers are a white with a hint of lilac color [106]. Additionally, when dried and crushed, the rhizomes produce a tasty yellow powder [107] known as a "body cleanser" in Indian traditional medicine, it has been utilized for ages in both Chinese and Ayurvedic medicine [108]. Turmeric is likely one of the most popular herbal supplements used by cancer patients [109]. A substantial amount of preclinical and clinical research supports the effectiveness of turmeric in cancer treatment [110]. Turmeric and curcumin/curcuminoids, the most studied phytochemicals in turmeric, are said to hinder enzymes that produce reactive oxygen species and inflammatory lipids (such as cyclooxygenases, lipoxygenase, xanthine oxidase, nitric oxides) at both functional and genomic levels [110,111]. Pro-inflammatory transcription factors including NFκB, STAT3, and different kinases like PKC, EFGR, and tyrosine kinase are inhibited by turmeric and its constituents. Furthermore, they increase antioxidant pathways by activating nuclear erythroid 2-related factor 2 (Nrf2) [112,113]. Curcumin's impressive anti-inflammatory and antioxidant capabilities have been demonstrated to provide promising outcomes in reducing side effects and enhancing the quality of life for cancer patients [114-117].

#### ***Respiratory diseases:***

Respiratory disease is a condition that can be either acute or chronic and impacts the airways and other parts of the lungs. Asthma, COPD, bronchitis, pneumonia, PH, occupational lung diseases, AR, and sinusitis are among the most frequently seen respiratory diseases and conditions [118]. Chronic respiratory diseases like interstitial lung disease, pulmonary sarcoidosis, and pneumoconiosis like silicosis and asbestosis are also part of the list that includes COPD and asthma. Regrettably, chronic respiratory diseases have not received as much public attention or research funding compared to other diseases like cardiovascular disease, cancer, stroke, diabetes, and Alzheimer's disease [119,120]. Every year, these illnesses impact a significant number of individuals and decrease a person's ability to perform daily tasks [121], and they are the primary reason individuals seek help from general practitioners globally [122]. Respiratory dysfunction rates vary based on the type and severity of pulmonary diseases [123]. Environmental variables like pollution and food, as well as personal factors like genetics and epigenetics, have contributed to the rise of inflammatory, allergic, cancerous, and immunodeficiency disorders during the past few decades [124]. These elements may trigger a number of detrimental and inflammatory reactions that result in the clinical manifestations of allergy disorders such as asthma [125]. Effective treatment of respiratory disorders requires early identification, management, prevention, and surveillance of respiratory conditions as well as the development of novel therapies to target these pathologies and restore immunological balance [126]. Two types of drugs are now being used to treat various respiratory disorders, such as asthma and COPDs, in order to

reduce symptoms and prevent the progression of disease severity. Medications used to treat asthma include beta-2 agonists, anticholinergics, methylxanthines, corticosteroids (mainly inhaled), leukotriene modifiers, mast cell stabilizers, and immunomodulators. The drugs used to treat respiratory conditions today have serious adverse effects and are not entirely effective. In order to treat respiratory problems, new drugs that are more efficient and have fewer adverse effects must be developed [127]. Herbal remedies are regarded as secure substances utilized as alternative and complementary treatments.

#### ***Basil:***

The *Ocimum*, also known as basil, is a group of plants that are highly valued for their aromatic, medicinal, decorative, sacred, and other pleasing attributes. It belongs to the *Ocimoideae* subfamily within the *Lamiaceae* family, being one of the biggest genera [128]. It is believed that Basil originates from Iran and/or India. The veneration of the sacred plant Tulsi is essential in Hinduism and observed throughout India. The term "Tulsi" comes from Sanskrit and means "incomparable one" or "matchless one" [129]. Tulsi is cultivated globally and can be categorized as Holy basil or Mediterranean basil. Holy basil, also referred to as Tulsi, is highly respected in India as a common household plant. In Ayurveda and Hinduism, holy basil is linked to the goddess of wealth, health, and prosperity. It is further split into four distinct species: *O. sanctum* (Rama-tulsi), *O. tenuiflorum* (Krishna-tulsi), *O. tenuiflorum* (Amrita-tulsi), and *O. gratissimum* (Vana-tulsi) [130]. Within the Mediterranean basil group, there are various subdivisions, such as Sweet basil (*O. basilicum*), Thai basil (*O. thyrsoiflora*), Lemon basil (*O. citriodorum*), Vietnamese basil (*O. cinnamomum*), American basil (*O. americanum*), and African blue basil (*O. kilimandscharicum*) [131]. Basil or Tulsi have a high amount of phytochemicals such as essential oils (eugenol, linalool, and methyl chavicol), phenolic compounds, and alkaloids which enhance their medicinal properties and biological effects [132]. Cooking methods like boiling, stir-frying, steaming, baking, and microwaving can preserve the vitamins, minerals, pigments, and phenolic compounds like rutin, rosmarinic acid, and quercetin found in basil leaves [133]. *Ocimum basilicum* is commonly utilized to treat various respiratory tract disorders such as asthma, bronchitis, cough, and gastrointestinal issues [134,135], Cardiovascular diseases [136], neurocognitive disorders [137], and metabolic disorders [138] are all serious health issues. *O. basilicum* has been shown to have a number of pharmacological actions, including anti-inflammatory qualities [139,140,141]. The flowers and leaves of *O. basilicum* are used as a stimulant, carminative, diuretic, febrifuge, infusion, syrup, and decoction. They are also frequently used for cough and bronchitis [142]. It has been shown that *O. basilicum* has bronchodilatory and relaxing effects. The leaf extract significantly reduced the contractile force of the tracheal smooth muscle caused by methacholine, KCl, and airway inflammation at different dosages [143,144,145].

#### ***Thyme:***

Steam distillation is used to extract thyme oil from the flowering aerial parts of *Thymus vulgaris* L., *Thymus zygis* Loeffl. ex L., or a mix of the two. Terpenoids and phenols, mainly thymol and/or carvacrol, make up thyme oil. Thyme oil is used medicinally to enhance the treatment of pertussis and to treat respiratory conditions such as bronchial catarrh [146].

#### ***Albizia lebbek:***

The large deciduous perennial tree *Albizia lebbek*, which belongs to the *Mimosaceae* family, is used to cure bronchitis, asthma, coughs, and colds [147]. In experiments, the liquid extract from *A. lebbek*'s bark showed anti-anaphylactic and anti-asthma properties [148].

#### ***Bryophyllum pinnatum:***

*Kalanchoe integra*, belonging to the *Crassulaceae* family, has displayed various pharmacological properties including antihelmintic, immunosuppressive, wound healing, hepatoprotective, anti-inflammatory, antidiabetic, nephroprotective, antioxidant, antimicrobial, analgesic, anticonvulsant, and antipyretic effects. Boiled leaf extracts of the plant have beneficial effects in treating respiratory disorders such as acute and chronic bronchitis, pneumonia, bronchial asthma, and palpitation [149].

#### ***Glycyrrhiza glabra:***

*Glycyrrhiza glabra*, from the *Fabaceae* family, is widely recognized as liquorice and has been utilized for both flavoring dishes and healing purposes for many centuries. Liquorice root has been widely employed globally for centuries in the treatment of cough. It includes active components such as glycyrrhizin, glycyrrhetic acid, flavonoids, isoflavonoids, and chalcones. The primary active compounds in glycyrrhizin and glycyrrhetic acid act as strong inhibitors of cortisol metabolism because of their steroid-like structures. The plant's root has been utilized for treating cough, colds, asthma, and COPD [150].

#### ***Hedychium spicatum:***

*Hedychium spicatum*, a tough perennial herb with rhizomes, belongs to the *Zingiberaceae* family and is known as Shati in Ayurvedic medicine. The rhizome extract of this medicinal plant is known to have essential oils, glycosides, and saccharides which are traditionally used for cough, asthma, and other respiratory issues and are also clinically used for treating asthma [151].

***Piper longum:***

*Piper longum*, belonging to the family Piperaceae, is utilized as a significant traditional remedy in Asia and the Pacific islands. *P. longum* is recognized as an effective treatment for tuberculosis and infections in the respiratory tract [152]. The plant's fruits and roots have been used to treat asthma in children [153]. Piperine, a primary alkaloid found in *P. longum* fruits, is able to prevent the release of T helper-2-mediated cytokines, eosinophil infiltration, and airway hyper-responsiveness in an OVA-induced asthma model [154].

***Diabetes:***

Diabetes mellitus (DM) is among the prominent diseases linked to illness and death in Africa. The literature indicates that approximately 19 million African adults are affected by diabetes [155]. Type 2 diabetes is a long-lasting condition that typically affects adults, particularly the elderly, and is identified by a reduced reaction to insulin (insulin resistance) causing problems with glucose regulation and prolonged high blood sugar levels. During the later phase of type 2 diabetes, beta-cell exhaustion causes the death of insulin-producing beta-cells in the pancreas [156]. An important consequence of diabetes is the growing vulnerability to infections [157]. Pre-existing diabetes in COVID-19 patients with upper respiratory viral infections has been identified as a comorbidity that can result in a more severe infection. Diabetes is often associated with complications such as neuropathy, retinopathy, nephropathy, and cardiovascular disease [158,159] may result in harm to organs and tissues, leading to issues like heart disease, kidney problems, and eye conditions [160]. Diabetics must administer hypoglycemic drugs promptly to control blood sugar levels and prevent complications. Oxidative stress plays a crucial part in elevating blood sugar levels, as well as in the development and advancement of DM, by decreasing the production of insulin by the pancreas [161]. Due to the disadvantages and expenses of different chemical hypoglycemic drugs for treating DM, there is an increasing inclination towards herbal remedies in controlling and managing this condition [162]. Currently, there is a growing interest among consumers in natural products because of their strong effectiveness and minimal toxicity. Numerous studies done before clinical trials have shown that edible plants can help in managing blood sugar levels and maintaining balanced diets as well [163, 164, 165, 166].

***Garlic:***

Garlic, also known as *A. sativum*, belongs to the Asparagales genus, Amaryllidaceae family, and Alliaceae subfamily. Garlic is rich in sulfur and can boost the immune system, with a strong ability to combat cancerous tumors [167]. The findings indicated that the alcohol-based extract of garlic notably decreased levels of glucose, triglycerides, cholesterol, urea, uric acid, AST, and ALT in the blood [168]. It is reported that the EC50 for electrical activity and insulin release in vitro is approximately 1 mmol, which is equivalent to 12 glucoses outside the physiological range. S-methylcysteine sulfoxide and S-allyl cysteine sulfoxide are recognized as effective antidiabetic compounds in onion (*Allium cepa*) and garlic (*Allium sativum*), respectively [169,170,171,172,173]. These substances exhibit strong antioxidant effects, regulating hepatic hexokinase enzyme activity, glucose 6-phosphatase, and HMG CoA reductase, as well as promoting insulin secretion dependent on glucose [174,175,176,177,178].

***Neem:***

The alcoholic extract of *A. indica* leaves has notable anti-inflammatory, anti-serotonin, anti-fertility, and hepatoprotective effects in its water-soluble portion [179]. Several researchers have reported that *A. indica* has a notable impact on reducing blood sugar levels in diabetic rats induced by alloxan and streptozotocin [180,181]. Analysis of the leaf extract of *A. indica* shows six compounds: quercetin-3-O-B-D-glucoside, myricetin-3-O-rutinoside, quercetin-3-O-rutinoside, kaempferol-3-O-rutinoside, kaempferol-3-O-B-D-glucoside, quercetin-3-O-L-rhamnoside [182]. It is believed that these chemicals could be the reason behind the antihyperlipidemic effects [183]. Studies show that levels of various lipids in diabetes patients can be reduced by *A. indica* leaf extracts. Its ability to lower lipid levels may act as a defense mechanism against the atherosclerosis commonly seen in diabetes mellitus.

***Aloe vera:***

Research has demonstrated that *Aloe vera* possesses properties that can help in managing diabetes and lowering blood sugar levels [184] [185]. There was a suggestion that the hypoglycaemic impact of *A. vera* might be due to the stimulation of insulin synthesis and/or release from the beta-cells of langerhans [186]. Treatment with *Aloe* leaf pulp quickly lowered blood sugar levels by 30% and 34% in non-STZ-diabetic rats after 2 and 3 hours of administration, respectively [187]. Similarly, *Aloe* leaf gel extract led to reductions of 11% and 14% in blood glucose levels 3 and 4 hours after administration. Both glibenclamide and *aloe* extract did not stimulate pancreatic  $\beta$  cells in type 2 diabetic rats, indicating that *Aloe* extracts do not lower blood glucose levels through insulin release from  $\beta$ -cells, but rather through glucose utilization outside the pancreas. In diabetics, giving extracts of *Aloe barbadensis* leaves led to a notable decrease in serum triglycerides and LDL cholesterol levels [188].

***Fenugreek:***

Fenugreek, also known as *T. Graecum Foenum*, is a plant belonging to the Leguminosae family. This plant originates from the Mediterranean area and is extensively grown in Ukraine, India, and China. Additionally, it is utilized as a paste and cream to treat acne, burns, swelling, and eczema [189]. The initial group was given one milligram of a solution containing fenugreek seeds in alcohol and water daily in capsule form, while the second group was given a placebo in the same dosage. Two months later, the first group treated with fenugreek extract showed increased insulin sensitivity and decreased blood glucose levels according to the results [190].

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## Conclusion:

Despite the promising findings, further research is necessary to fully understand the mechanisms of action, optimal dosages, and long-term safety of herbal therapies. Additionally, standardized quality control measures are crucial to ensure consistency and reliability of herbal products. In conclusion, herbal therapies hold significant promise as complementary or alternative approaches to managing chronic diseases. As scientific research continues to advance, their role in healthcare is likely to expand. By integrating evidence-based herbal therapies into clinical practice, healthcare providers can offer patients a wider range of options for improving their quality of life.

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