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"A REVIEW ON HERBAL APPROACHES IN PAIN RELIEF, Inflammation CONTROL, AND FEVER REDUCTION"

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Abstract:
This article explores the rich therapeutic potential of herbal medicines used for pain relief, inflammation control, and fever reduction, highlighting both traditional knowledge and modern scientific validation. It presents an overview of key medicinal plants—such as ginger, turmeric, clove, willow bark, aloe vera, green tea, tulsi, boswellia, ashwagandha, neem, black pepper, chirayata, guduchi, and kala siris—and explains the bioactive compounds responsible for their pharmacological effects. By examining their mechanisms of action, including COX/LOX inhibition, modulation of NF-κB pathways, antimicrobial activity, immune regulation, and diaphoretic effects, the article demonstrates how these plants provide effective natural alternatives to conventional drugs. Through integration of historical use, phytochemical profiles, and scientific evidence, this work underscores the continued relevance of herbal remedies in modern healthcare and supports their role in safe, holistic, and accessible treatment strategies.

Keywords: Herbal, analgesic, anti-inflammatory, antipyretic, phytochemicals,

I. Introduction

The relationship between humans and plants is as old as humanity itself. Since the dawn of civilization, our ancestors have looked to the natural world not just for food and shelter, but for healing. This profound connection forms the foundation of herbal medicine, the world's oldest and most enduring healthcare system. For thousands of years, across every culture and continent, people have discovered and utilized the therapeutic properties of leaves, roots, flowers, seeds, and bark to alleviate suffering, treat diseases, and promote overall well-being (1). This deep, empirical knowledge was carefully observed, tested,and passed down through generations, forming the core of great traditional medicine systems like Ayurveda in India, Traditional Chinese Medicine (TCM), and various indigenous healing practices (2). The history of herbal medicine is inextricably linked to the history of human health. Ancient texts provide clear evidence of sophisticated plant-based pharmacopoeias. The Egyptian Ebers Papyrus (c. 1550 BC) documents over 700 plant-based formulas (3). Similarly, the Ayurvedic texts of Charaka Samhita and Sushruta Samhita, compiled over 2000 years ago, describe hundreds of medicinal plants and their detailed uses (4). In the West, Greek and Roman physicians like Hippocrates and Galen documented their use of herbs, forming the basis of Western medicine for centuries (5). A pivotal turning point came when scientists began to realize that these traditional remedies held the key to modern therapeutic discovery. This process, known as phytopharmacology, involves isolating, characterizing, and standardizing the active chemical compounds within plants (6). Many of the most groundbreaking medicines we rely on today are derived from or inspired by plant sources: The pain-relieving power of Willow Bark (Salix alba) led to the isolation of salicin, which became the prototype for Aspirin (acetylsalicylic acid) (7). The heart medicine Digoxin, a life-saving drug for heart failure, was derived from the Foxglove plan(Digitalis purpurea) (8). Quinine, an essential antimalarial drug, was extracted from the bark of the Cinchona tree (9).Most famously, Artemisinin, a potent antimalarial compound discovered from Sweet Wormwood (Artemisia annua) based on a ancient Chinese text, earned Tu Youyou the Nobel Prize in Physiology or Medicine in 2015 (10). These discoveries validate traditional knowledge and confirm that plants produce a vast array of bioactive compounds— such as alkaloids, flavonoids, terpenoids, and tannins—as defense mechanisms, which humans have learned to harness for healing.This historical journey underscores that nature has been, and continues to be, the world's most prolific chemist.Pain is a complex and universal sensory and emotional experience that signals actual or potential tissue damage. Analgesic medicines are substances that selectively relieve pain without causing a loss of consciousness (11). Herbal analgesics offer a multifaceted approach to

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pain management, often working through several mechanisms simultaneously and presenting a favorablesideeffect profile compared to some synthetic drugs (12).The efficacy of these plants is due to their rich composition of phytochemicals that interact with the body‘s intricate pain pathways, including the nervous and inflammatory systems (13).

II. Key Examples and Their Mechanisms of Analgesic.

2.1 Willow Bark (Salix alba): Often hailed as "nature's aspirin," willow bark has been used for millennia to relieve pain and fever. Its primary active component, salicin, is converted in the human liver to salicylic acid (14).

2.2 Clove (Syzygium aromaticum): The dried flower buds of clove are a renowned remedy for dental pain. Their potent analgesic and antiseptic properties are attributed to eugenol, which constitutes 7090% of clove essential oil. Eugenol acts as a natural local anesthetic by blocking voltage-gated sodium channels in neuronal membranes, preventing the transmission of pain signals to the brain (15).

2.3 Turmeric (Curcuma longa): This bright golden spice is a cornerstone of Ayurvedic medicine. Its primary active constituent, curcumin, is a powerful anti-inflammatory agent. Curcumin downregulates the activity of the nuclear factor-kappa B (NF-κB) pathway, a key protein complex that controls the transcription of DNA related to inflammation and cell survival(16).

2.4 Capsicum (Cayenne Pepper): The fruit of Capsicum annuum contains capsaicin, the compound responsible for its spicy heat. Topically applied capsaicin works through a unique mechanism: it initially stimulates and then depletes Substance P, a neuropeptide that carries pain signals from peripheral nerves to the brain (17).

Inflammation is the body's fundamental, protective response to harmful stimuli like pathogens, damaged cells, or irritants. It is a complex biological process involving immune cells, blood vessels, and molecular mediators. While acute inflammation is beneficial for healing, chronic inflammation can become destructive, leading to pain, swelling, redness, heat, and is a underlying factor in diseases like arthritis, asthma, and even heart disease (18). Herbal anti- inflammatories work by modulating this immune response, often providing relief without completely suppressing the body's natural defense mechanisms (19).

2.5 Shallaki.(IndianFrankincense) As previously mentioned, curcumin is one of the most extensively researched natural anti-inflammatory compounds. Its ability to inhibit the NF-κB pathway places it at the heart of the inflammatory process. Numerous clinical studies have shown its efficacy in reducing pain and improving function in patients with osteoarthritis, often matching the effectiveness of some conventional NSAIDs with a better safety profile (20).

2.6 Ginger (Zingiber officinale): The rhizome of ginger is rich in pungent compounds like gingerols and shogaols. Similar to synthetic non-steroidal anti-inflammatory drugs (NSAIDs) like ibuprofen, these compounds inhibit both cyclooxygenase (COX) and lipoxygenase (LOX) enzymes. This dual inhibition is particularly effective as it blocks the production of a wider range of pro- inflammatory prostaglandins and leukotrienes, making ginger highly effective for reducing muscle pain, menstrual pain, and inflammatory joint diseases (21).

2.7 Aloe Vera: The clear gel from the leaves of the Aloe barbadensis miller plant is a classic topical antiinflammatory. Its healing properties are attributed to a polysaccharide called acemannan, along with other compounds like gibberellins and salicylic acid. These substances inhibit the production of prostaglandins and thromboxane, reduce redness and swelling, boost collagen formation, and promote wound contraction, making it exceptional for treating burns, sunburns, and skin inflammation (22).

2.8 Boswellia (Indian Frankincense): The resin from Boswellia serrata trees contains active triterpenoids called boswellic acids. Unlike NSAIDs, boswellic acids specifically target an enzyme called 5-lipoxygenase (5-LOX), which is responsible for producing leukotrienes—inflammatory molecules that cause bronchoconstriction and attract inflammatory cells (23). This targeted action makes Boswellia a valuable remedy for inflammatory conditions like osteoarthritis, rheumatoid arthritis, and inflammatory bowel diseases (IBD) like Crohn's disease and ulcerative colitis.

III. Herbal Antipyretics: Nature's Fever Reducers.

Fever (pyrexia) is a controlled increase in core body temperature, orchestrated by the hypothalamus in response to pathogens like bacteria and viruses. It is a beneficial defense mechanism, as higher

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temperatures enhance immune function and inhibit microbial replication. However, an excessively high fever can be dangerous, leading to discomfort, dehydration, and febrile seizures. Antipyretic medicines work by reset the hypothalamus's temperature set-point to normal (24). Many herbs facilitate this process through diaphoresis (promoting sweating) and innate antimicrobial actions (25).

a. **Holy Basil (Tulsi) (Ocimum sanctum):** Revered in Ayurveda as the "Queen of Herbs," Tulsi is classified as an adaptogen, helping the body adapt to stress. It is a premier remedy for fevers and infections. Its antipyretic effect is believed to stem from its diaphoretic property (inducing sweating), which cools the body through evaporation. Furthermore, its essential oils (like eugenol) possess broadspectrum antimicrobial activity, helping to combat the underlying infection causing the fever (26).

b. **Neem (Azadirachta indica):** Known as the "village pharmacy" in India, every part of the neem tree is medicinal. Its leaves are particularly valued for their antipyretic, blood-purifying, and antimicrobial properties . Compounds like gedunin and nimbidin demonstrated significant fever-reducing and antimalarial activities in studies (27).

c. **Peppermint (Mentha piperita):** The leaves of peppermint are rich in menthol, which provides a powerful cooling sensation by activating cold-sensitive receptors (TRPM8 channels) in the skin and mucous membranes. When consumed as a tea, it promotes sweating (diaphoresis), helping to dissipate body heat. While its direct impact on the hypothalamic set-point may be less pronounced, its soothing and cooling effects provide significant relief from the malaise and discomfort that accompany a fever (28).

d. **Yarrow (Achillea millefolium):** This traditional European herb is a powerful diaphoretic. It is commonly used at the onset of a fever or flu; a hot tea made from yarrow flowers opens the pores and stimulates sweating, helping to "break" the fever and eliminate toxins through the skin, thereby reducing the body's temperature (29).

IV. Herbal Analgesic Plants.

4.1Ginger (Zingiber officinale)

4.1Synonym: Zingibere, Gingerin, Rhizomazingiberis, Adrak

4.1.2 Biological Source & Family: Dried rhizomes of Zingiber officinale, Family Zingiberaceae (30)

4.1.3 Chemical Constituents: Phenolics, Terpenes, Gingerols, Shogaols, Zingerone, Paradols (31)

4.1.4 Chemical Constituents Responsible for Analgesic Activity: Gingerols, Shogaols (32**4.1.5 Uses:**Reduces arthritis and joint pain ,Relieves muscle soreness and stiffness ,Eases migraine and headache , Anti-inflammatory effects help in injury recovery ,Supportsdigestion and reduces nausea(33)

4.1.6Application: Ginger is a very useful plant. Its root is used as a medicine. The main reason it can reduce pain is because it contains special compounds called gingerols. These compounds stop our body from making certain chemicals that cause pain and swelling. This is why ginger is good for reducing joint pain, muscle pain, and even headaches. (34) Ginger in the treatment of colds and flu, as well as support for immunity, digestive issues, and positive effects on the Cardiovascular and immunological systems, was conducted.(35)Ginger is loaded with antioxidants, compounds that prevent stress and Damage to your body‘s DNA. They may help your body fight off chronic diseases like high blood pressure, heart disease, and diseases of the lungs,Ifyou‘re pregnant, don‘t consume more than 1 gram Of ginger extract per day.(36) Other suggested use for ginger includes the treatment of conditions Like fever, indigestion, nausea, hypertension, dementia, and constipation(37).

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Fig no.1 Ginger (38).

V.Turmeric (Curcuma longa)

5.1 Synonym: Haldi, Indian Saffron, Haridra

5.2 Biological Source & Family: Dried rhizomes of Curcuma longa Linn., Family Zingiberaceae (39).

5.3ChemicalConstituents: Curcumin,Demethoxycurcumin,Bisdemethoxycurcumin, Turmerone, Atlantone, Zingiberene (40).

5.4 Chemical Constituents Responsible for Analgesic Activity: Curcumin, Turmerone (41).

5.5 Uses: Relieves arthritis and muscle pain , Reduces joint swelling and inflammation , Promotes wound healing and skin repair , Speeds recovery after injury , Antioxidant properties protect against tissue damage (42).

5.6 Application: Turmeric is a yellow-coloured spice. Its most important component is curcumin. Curcumin is very good at fighting inflammation. It works by blocking a protein in our body that triggers pain and swelling. That is why turmeric is often used for treating arthritis and for healing wounds faster.(43).Recent Studies have authenticated the use of turmeric for various diseases especially oxidative stressInduced ones such as cancer, diabetes mellitus and inflammatory disorders. It also is used as Hepatoprotective, nephroprotective, anticoagulant and anti-HIV to combat AIDS. Curcumin, asA spice, exhibits great promise as a therapeutic agent.(44).Turmeric has been used for conditions such as liver obstruction.And jaundice and has been applied externally for ulcers and inflammation. Roasted turmeric has Been used as an ingredient of a preparation used for dysentery. Turmeric has also been used in Tooth powder or paste.(45).

Fig No.2 Turmeric(46).

VI. Clove (Syzygium aromaticum)

6.1Synonym: Lavang, Caryophyllusaromaticus

6.2Biological Source & Family: Dried flower buds of Syzygium aromaticum, Family Myrtaceae(47).

6.3Chemical Constituents: Eugenol, Eugenyl acetate, Caryophyllene, Tannins(48).

6.4Chemical Constituents Responsible for Analgesic Activity: Eugenol(49).

6.5Uses: Provides fast relief from toothache and gum pain, Acts as an antiseptic and antiinflammatory, agent Soothes mouth ulcers and oral infections , Helps relieve joint and muscle pain when applied topically(50).

6.6Application: Clove is a common spice used in cooking. It is also very good for relieving toothache. This is because it has an oil that contains a substance called eugenol. Eugenol acts as a natural painkiller by numbing the area and killing germs that cause infection.(51). Clove is use in antioxidants, Help protect against cancer, it can also kill bacteria, helpful in liver health, regulate blood sugar, and help in Many more health

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problems.(52)One of the most valuable spices that has been used as food Preservatives and also used for the treatment of various medical conditions like dentistry and Research confirms it is effective at inhibiting the growth of foodborne pathogens, certain bacteria, And fungi.(53).

Fig No.3 Clove (54).

VII. Willow Bark (Salix alba)

7.1 Synonym: White willow, Salicis cortex

7.2 Biological Source & Family: Bark of Salix alba and related species, Family Salicaceae(55).

7.3 Chemical Constituents: Salicin, Salicortin, Flavonoids, Tannins(56).

7.4 Chemical Constituents Responsible for Analgesic Activity: Salicin(57).

7.5 Uses: Relieves headache and migraine , Reduces joint pain and stiffness (especially in osteoarthritis)(58)

7.6 Application: Willow bark is like a natural form of aspirin. It contains a chemical named salicin. When we consume it, our body converts salicin into a substance that reduces pain and fever. It is very effective in treating headaches, backaches, and joint pain.(59) Has been an incredibly useful temperate plant For humans, with widespread global distribution and species indigenous to all continents Except Antarctica. Use in an integrated biorefinery to produce a range of biobased materials, including pharmaceuticals, Andbiocomposites, fuels, energy and fertiliser.(60) Which can be used in medical And veterinary applications. These high-yielding willow varieties grow well in the wetter regions of the globe, Including NW Europe, (61)

Fig No.4 Willow Bark (62).

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VIII. Peppermint (Mentha piperita)

8.1Synonym: Brandy mint, Balm mint

8.2Biological Source & Family: Leaves and flowering tops of Mentha piperita, Family Lamiaceae(63).

8.3Chemical Constituents: Menthol, Menthone, Isomenthone, Flavonoids (64).

8.4Chemical Constituents Responsible for Analgesic Activity: Menthol(65).

8.5Uses: Relieves headache and tension ,Reduces muscle cramps and spasms ,Provides cooling sensation to soothe pain , Aids digestion and reduces bloating , Clears nasal passages in cold and cough(66).

8.6Application: Peppermint leaves have a cooling effect. This is because of a component called menthol. When we apply peppermint oil, the menthol gives a cold sensation that helps to distract the brain from the pain. It is very useful for headaches and muscle pains.(67). Peppermint oil and its other by-products are generally used for Candies, teas, mouth freshener, toothpaste, beverages, alcoholic liqueurs, jellies, syrups, ice creams, Cough drops, chewing gums, confectioneries, soaps, detergents, and mosquito repellents. It is a highly Perishable and seasonal plant,(68).Are used to make peppermint oil. Numerous well-known essential oil species, including spearmint,Basil, lavender, rosemary, sage, marjoram, and thyme, belong to this family. Known for its numerous Therapeutic benefits, including analgesic, anesthetic, antiseptic, astringent, carminative, decongestant,Expectorant, nervine, stimulant, stomachic, inflammatory diseases, ulcer, and stomach problems, this plant is Highly valued in many indigenous medical systems. (69)

Fig No.5 Peppermint (70)

IX. Herbal Anti Inflammatory Plants.

9.1 Aloe vera (Aloe barbadensis miller)

9.1.1 Synonym: Ghritkumari, Aloe indica

9.1.2. Biological Source & Family: Leaves of Aloe vera, Family Asphodelaceae(71).

9.1.3 Chemical Constituents: Aloin, Emodin, Polysaccharides, Saponins, Acemannan(72).

9.1.4 Chemical Constituents Responsible for Anti-inflammatory Activity: Acemannan, Emodin(73).

9.1.5 Uses: Reduces skin inflammation in burns and wounds ,Soothes sunburn and rashes ,psoriasis ,Decreases redness and swelling in insect bites ,Accelerates healing by reducing inflammatory cytokines , Helps in inflammatory skin diseases like eczema(74).

9.1.6 Application: Aloe vera is a common plant with thick, fleshy leaves. The gel inside these leaves is widely used to soothe skin problems. This gel contains special compounds like acemannan and emodin. These compounds work by stopping the skin from making chemicals that cause redness, swelling, and pain. This is why aloe vera gel is so effective for treating burns, sunburns, and skin rashes quickly.(75). It is also used For its antibacterial, anesthetic and antiseptic properties, The part of the Aloe vera Which is used are the leaves. The Aloe is an Emollient, Purgative and

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Vulnerary Although it is being used for the treatment of skin cancer. Aloe is very useful on rashes Caused by Poison Ivy, (76).There is a rich tradition of using herbal medicine for the treatment of Many infectious diseases. Plants for use as herbal Medicine.(77).The herb is used internally to combat most digestive problems, including constipation, poor appetite, colitis, irritable Bowel syndrome as well as, asthma, diabetes, immune system enhancement, peptic ulcers,(78).

Fig No.6 Aloe vera(79).

X. Green Tea (Camellia sinensis)

10.1 Synonym: Thea sinensis, Green tea leaves (80).

10.2 Biological Source & Family: Dried leaves of Camellia sinensis, Family Theaceae (81). **10.3 Chemical Constituents:** Epigallocatechin gallate (EGCG), Catechins, Polyphenols, Caffeine(82).

10.4 Chemical Constituents Responsible for Anti-inflammatory Activity: EGCG, Catechins(83).

10.5 Uses: Reduces systemic inflammation in chronic diseases ,Protects joints from inflammatory damage ,Improves skin inflammation in acne and dermatitis ,Supports cardiovascular health by reducing vessel inflammation , Lowers oxidative stress-related inflammation(84).

10.6 Application: Green tea is made from the dried leaves of the Camellia sinensis plant. It is rich in powerful antioxidants called catechins, with EGCG being the most important one. These catechins fight inflammation throughout the body. They stop the action of certain enzymes and proteins that lead to swelling and pain. This makes green tea helpful for internal inflammation in joints and blood vessels.(85). Practitioners used green tea as a stimulant, diuretic (to promote the excretion of Urine), astringent (to control bleeding and help heal wounds), and to improve heart health.(86).It was used to detoxify the body. This attracted many scientists to work on green tea and Discover its therapeutic properties. One of them is its Antimicrobial property in curing various infections.(87).

Fig No.7 Green Tea (88).

XI. Holy Basil (Tulsi) (Ocimum sanctum)

11.1Synonym: Tulasi, Sacred basil

11.2 Biological Source & Family: Leaves and aerial parts of Ocimum sanctum Linn., Family Lamiaceae(89).

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11.3 Chemical Constituents: Eugenol, Rosmarinic acid, Ursolic acid, Flavonoids(90).

11.4 Chemical Constituents Responsible for Anti-inflammatory Activity: Eugenol, Rosmarinicacid(91).

11.5 Uses: Reduces inflammation in respiratory tract infections ,Relieves swelling and redness in skin , Supports immune system in inflammatory disorders(92).

11.6 Application: Holy Basil, also known as Tulsi, is a sacred plant in India. Its leaves are used as medicine. The plant contains eugenol and rosmarinic acid, which are strong anti-inflammatory agents. These compounds help by lowering the body's stress response and blocking pathways that create inflammation. Tulsi is used for respiratory inflammation, skin issues, and joint pain.(93). The explored Examinations strengthen customary uses and propose tulsi is a viable treatment for way of life Related constant maladies including diabetes, metabolic condition, and mental pressure.(94) Arpoora Tulsi is mostly used in the herbal toiletry and also against the insects and bacteria. A Tulsi also Helps in curing malaria. The use of tulsi helps to ease from different skin Allergies and helps to fight the different skin diseases like acne, ringworm, eczema and various other infections.(95)

Fig No.8 Holy Basil (96).

XII. Shallaki (Indian Frankincense)

12.1Biological Source & Family: Oleo-gum-resin from the bark of Boswellia serrata Roxb., family Burseraceae.(97).

12.2Chemical Constituents: Boswellic acids (β-Boswellic acid, Acetyl-β-Boswellic acid, AKBA), Polysaccharides, Essential oils.(98).

12.3Chemical Constituents Responsible for Anti-inflammatory Activity: Boswellic Acids, especially Acetyl-11-keto-β-boswellic acid (AKBA) (they inhibit the production of inflammatory leukotrienes).(99).

12.4Uses: Highly effective in managing inflammatory joint disorders like osteoarthritis, rheumatoid arthritis, and gout , Helps reduce pain and improve mobility , Used in the treatment of inflammatory bowel disease (IBD) like Crohn's disease and ulcerative colitis.(100).

12.5Application: Shallaki is a tree from which a gum-resin is extracted. This resin contains unique acids called boswellic acids. These acids are very effective because they block an enzyme that produces inflammatory chemicals called leukotrienes. This specific action makes Shallaki excellent for treating chronic inflammatory diseases like arthritis and inflammatory bowel disease (IBD) without the side effects of common drugs.(101). The tree is used for Fodder, timber, medicinal, religious and in cosmetics. The micropropagation Method were used for culturing cotyledonary node and leaf node.(102)—Shallaki‖ is a widely used active ingredient in the —Unani‖ —Siddha‖ and —Ayurvedic‖ medicines oriented for the treatment of inflammation and pain.(103).

Fig No.9 shallaki(104).

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13. Ashwagandha (Winter Cherry)

13.1 Biological Source & Family: Roots of Withaniasomnifera (L.) Dunal, family Solanaceae.(105).

13.2 Chemical Constituents: Withanolides (Withaferin A, Withanolide D), Alkaloids (Isopelletierine, Anaferine), Sitoindosides.(106).

13.3 Chemical Constituents Responsible for Anti-inflammatory Activity: Withaferin A (a key withanolide that modulates the immune response and reduces inflammation).(107)

13.4 Uses: An adaptogen that reduces stress-induced inflammation in the bod ,Used to treat inflammatory conditions like arthritis and lupus , Supports the nervous system, reduces anxiety, and improves vitality ,Has antioxidant and immunomodulatory properties.(108)

13.5Application: Ashwagandha is a powerful adaptogenic herb, meaning it helps the body manage stress. Its roots contain compounds called withanolides, with withaferin A being the most important for inflammation. This compound works by calming the immune system's overactivity, which is often the cause of chronic inflammation. It is very useful for stress-related inflammation and autoimmune conditions. It has been used for centuries to treat many ailments and is considered an adaptogen, Meaning it helps the body to manage stress. (109).The dried roots of the plant are used in the treatment of Nervous and sexual disorders. It is one of the most important Herbs used for millennia as a Rasayana (Rejuvenator) for its Wide ranging health benefits. (110).

Fig.10 Ashwagandha(111).

14.Herbal Antipyretic Plants

14.1 Neem (Azadirachta indica)

14.1.1 Synonym: Indian lilac, Margosa tree

14.1.2 Biological Source & Family: Leaves, bark, and seeds of Azadirachta indica A. Juss., Family Meliaceae(112).

14.1.3 Chemical Constituents: Nimbin, Nimbidin, Azadirachtin, Quercetin, Flavonoids(113).

14.1.4 Chemical Constituents Responsible for Antipyretic Activity: Nimbidin, Quercetin(114).

14.1.5 Uses: Reduces fever in malaria and viral infections ,Acts as an anti-inflammatory and immune booster ,Helps in skin infections and septic conditions ,Detoxifies blood and supports liver function , Used in Ayurvedic preparations for chronic fevers(115).

14.1.6 Application: Neem is a very common tree in India, often called the _village pharmacy‘. Its leaves, bark, and seeds have strong medicinal properties. The chemicals nimbidin and quercetin in neem are especially good at reducing fever. They work by fighting the infections that cause the fever and by helping the body‘s own immune system to work better. This is why neem is used in fevers like malaria and in viral infections.(116).Many foods are prepared using Bark, leaves, flowers, seeds, oil, and other materials in the Traditional System of Medicine.non-toxic herbal items should be used with specific concentration to control animal and human ailments.(117)All parts of the Neem tree viz., leaves, flowers, seeds, fruits, roots And bark have been used traditionally for the Treatment of inflammation, infections, fever, skin Diseases, dental disorders, etc. Every part of the Neem tree viz., roots, seeds, flowers, bark, leaves, Fruit pulp and its constituents have been Demonstrated to exhibit immune modulatory,anti-Inflammatory,anti hyperglycaemic,antiulcer,Antimalarial,antifungal,antibacterial, antiviral,Antioxidant, antimutagenic, anti-diabetic and anti-Carcinogenic properties.Has been used for millennia as a traditional remedy,(118).

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Fig No.11 Neem (119).

15. Black Pepper (Piper nigrum)

15.1 Synonym: Kali mirch, Peppercorn

15.2 Biological Source & Family: Dried ripe berries of Piper nigrum Linn., Family Piperaceae(120).

15.3 Chemical Constituents: Piperine, Chavicine, Piperidine, Essential oils(121).

15.4 Chemical Constituents Responsible for Antipyretic Activity: Piperine(122).

15.5 Uses: Reduces fever by stimulating blood circulation and sweating ,Improves bioavailability of other herbal antipyretics ,Relieves cold, cough, and flu symptoms ,Enhances digestion and reduces nausea during fever , Used in Ayurvedic "Trikatu" for fever management(123).

15.6Application:

Black pepper is not just a spice; it is also a good medicine. The compound piperine gives black pepper its sharp taste and is also responsible for reducing fever. Piperine helps by improving blood circulation and promoting sweating, which naturally cools down the body. It also helps the body absorb other medicines better, making them more effective.(124).Piper nigrum is used in the treatment of various microbial diseases, cancer, diabetic, skin diseases, tooth Ache, urinary tract infections, toxic mega-colon, auto-immune disorders, asthma, bronchitis, cough, sinus Infection, measles, scabies, thyroid, obesity, gastrointestinal diseases, neurological, cardiovascular, and Inflammatory diseases as well as pesticides, bactericides, insecticides and microbicide.(125)From ancient times it Is not only used for culinary purpose but also for its diverse therapeutic properties like Anti-Bacterial ,Antidiarrheal, Immunomodulatory, Antitumor, Anti-depressant, Hepatoprotective Activity,

Bronchodilator, Anti-obesity, Anti-Oxidant, Anti-Thyroid, Antihypertensive effect, AntiInflammatory, Anticonvulsant effect, Anti-Diabetic, Anti-Fertility, Anti-fungal, Bioavailability Enhancer, Anti-Allergic, Vitiligo, (126)

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Fig No.12 Black Pepper(127).

16. Chirayata (Indian Gentian)

16.1Biological Source & Family: Whole plant of Swertia chirata (Roxb. ex Fleming) Karsten, family Gentianaceae.(128)

16.2 Chemical Constituents: Amarogentin, Swertiamarin, Mangiferin, Swerchirin, Opelicacid.(129).

16.3 Chemical Constituents Responsible for Antipyretic Activity: Amarogentin and Swertiamarin (bitter principles that stimulate digestion and reduce fever).(130)

16.4 Uses: Highly effective in treating intermittent fevers, like malaria ,Acts as a bitter tonic and stomachic (improves digestion ,Used for skin diseases and cleansing the blood , Strong anti-inflammatory properties.(131)

16.5 Application: Chirayata is a very bitter herb, and this bitterness is key to its medicine value. The bitter compounds amarogentin and swertiamarin stimulate digestion and help reduce fever. It is particularly famous for treating recurring fevers like malaria. It also helps to clean the blood and reduce inflammation.(132) It is used for chronic Fever, malaria, anemia, liver disorders, hypertension, dyspepsia, gastritis, ulcers, constipation, and skin Diseasesd(133).Is used in traditional medicine to treat numerous ailments such as liver Disorders, malaria, and diabetes and are reported to have a wide spectrum of pharmacological Properties. Its medicinal usage is welldocumented in Indian pharmaceutical codex,(134).

Fig No.13 Chirayata (135).

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17. Guduchi (Giloy, Tinospora)

17.1Biological Source & Family: Stem of Tinospora cordifolia (Willd.) Miers, family Menispermaceae.(136).

17.2 Chemical Constituents: Berberine, Tinosporicide, Jatrorrhizine.(137).

17.3 Chemical Constituents Responsible for Antipyretic Activity: Berberine (a potent alkaloid with antimicrobial and antipyretic effects).(138).

17.4 Uses: Known as "Amrita" (nectar) for its wide-ranging benefits. A premier herb for chronic and recurrent fevers ,Extremely powerful immunomodulator , Detoxifies the body and supports liverfunction ,Used in dengue fever to increase platelet count.(139).

17.5 Application: Guduchi, also known as Giloy, is one of the most important herbs in Ayurveda for fever. Its stem contains berberine, a powerful alkaloid that kills microbes and reduces fever. It is called ‗Amrita' (nectar) because of its amazing ability to fight long-lasting fevers and boost immunity. It is even used in dengue fever to increase platelet count.(140).Tinospora, among the few herbs advocated to be used in ardra (fresh) condition..Guduchi is also used in Pharmaceutical procedures like Shodhana (processing), Marana (calcination) and Jarana (incineration) of various metals Andminerals.(141).A significant portion of the population receives treatment from traditional systems of medicine based on medicinal Plants. T.cardifolia had a variety of pharmacological properties, including antibacterial, antidiabetic, Hepatic problem, and antiosteoporotic effects. (142).

Fig No.14 Guduchi (143).

18. Kala Siris (Black Siris)

18.1 Biological Source & Family: Bark of Albizia lebbeck (L.) Benth., family Fabaceae (Leguminosae).(144).

18.2 Chemical Constituents: Saponins, Albizzin, Tannins, Flavonoids, Glycosides.(145).

18.3 Chemical Constituents Responsible for Antipyretic Activity: Saponins and Flavonoids.(146).

18.4 Uses: Effective in allergic conditions and reducing fever ,Used as an antitoxin and for treating snake bites ,Has anti-inflammatory and anti-arthritic properties.(147).

18.5 Application: Kala Siris is a tree whose bark is used for medicine. The bark contains saponins and flavonoids which have properties that reduce fever and allergies. It is also known for its anti-toxic effects and has been used traditionally for treating snake bites. It helps in reducing fever by calming the body‗s inflammatory response.(148).It has also been used in the treatment Of respiratory problems like bronchial asthma and seasonal cough and cold. Kwath (herbal tea) made from Bark of Shirish is indicated for asthmatics as it helps to control the frequency and intensity of the dyspnoea Due to asthmatic attacks. (149).

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Fig No.15 Kala Siri (150).

- **Mechanism of Action of Common Herbal Analgesics:**

Drug	Machanism	Uses	Reference
1.Ginger (Zingiber officinale)	Gingerols & shogaols inhibit COX/LOX → reduce prostaglandins & leukotrienes.	Arthritis, muscle pain, nausea.	Grzanna et al. (2005)
2.Turmeric (Curcuma longa)	Curcumin inhibits NF- κB signalling; antioxidant; reduces inflammatory mediators.	Anti-inflammatory, wound healing.	Aggarwal & Harikumar (2009) Capsicum
3.Clove (Syzygiumaromaticum)	Eugenol blocks sodium channels in neurons → local anesthetic; antimicrobial.	Dental pain, topical analgesic.	Chaieb et al. (2007)
4.Willow Bark (Salix alba)	Salicin → converted to salicylic acid; inhibits prostaglandin synthesis (COX pathway).	Analgesic & antipyretic (like aspirin).	Vane & Botting (2003)
5.Peppermint (Mentha piperita)	Menthol activates TRPM8 (cold receptor) → cooling sensation; modulates pain.	Headache, cramps.	McKay & Blumberg (2006)

- **Mechanism of Action of Common Herbal Anti-inflammatory:**

Drug	Machanism	Uses	Reference
6.Aloe Vera	Polysaccharides & emodin reduce cytokines/prostaglandins; promotes healing.	Burns, wound healing.	Heggers et al. (1996)
7.Green Tea (Camellia sinensis)	Catechins (EGCG) inhibit NF-κB; antioxidant; reduce oxidative stress.	Joint protection, systemic inflammation.	Singh et al. (2011)

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8.Holy Basil / Tulsi	Eugenol &rosmarinic acid reduce inflammatory mediators; immunomodulatory.	Fever, respiratory issues.	Cohen (2014)
9.Boswellia / Shallaki	Boswellic acids inhibit 5LOX → reduce leukotrienes.	Osteoarthritis, IBD.	Ammon (2006)
10.Ashwagandha	Withanolides modulate NF-κB& immune response; adaptogen.	Stress, arthritis.	Mishra et al. (2000)

- **Mechanism of Action of Common Herbal Antipyretic:**

Drug	**Machanism**	**Uses**	**Reference**
11.Neem (Azadirachta indica)	Nimbidin& quercetin → antimicrobial &antiinflammatory.	Fever, skin infections.	Biswas et al. (2002)
12.Black Pepper (Piper nigrum)	Piperine stimulates circulation; enhances absorption.	Fever relief, absorption enhancer.	Srinivasan (2007)
13.Chirayata (Swertia chirata)	Amarogentinstimulates digestion; antiinflammatory, antipyretic.	Malaria fever, tonic.	Joshi & Dhawan (2005) Guduchi
14.Guduchi (Tinospora cordifolia)	Alkaloids modulate immunity; antipyretic & antimicrobial.	Chronic fever, immunity.	Sinha et al. (2004)
15.Kala Siris (Albizia lebbeck)	Saponins & flavonoids → antiinflammatory & antioxidant.	Fever reduction, antiallergic.	Pal & Mishra (2017)

Conclusion:

Herbal medicine, rooted in centuries of traditional knowledge, continues to play a vital role in modern healthcare by offering safe, natural, and effective alternatives for managing pain, inflammation, and fever. Plants such as ginger, turmeric, clove, willow bark, neem, tulsi, guduchi, and many others contain powerful phytochemicals that work through scientifically established mechanisms, including modulation of inflammatory pathways, suppression of pain mediators, and enhancement of immune responses. Their therapeutic benefits—ranging from analgesic and antiinflammatory effects to antipyretic and antimicrobial actions—highlight the immense medicinal potential hidden within nature. As research continues to validate these traditional remedies, herbal medicines stand as promising, accessible, and holistic options that bridge ancient wisdom with modern scientific understanding.

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