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BNHC E-MAGAZINE

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***On behalf of BioNatural Healing College (BNHC), it is with great pleasure that we extend Thanks & appreciation to Ms. Nishat Afroz Ph.D candidates & Dr. Arif Ahmad for their very informative research article and contribution to this June BNHC E-Magazine edition*. We look forward to receiving their invaluable contribution in the future and wish them much success in future endeavors.**

Message: from the President of BioNatural Healing College (BNHC)

Greetings!

I am thrilled to express my heartfelt gratitude to the Almighty God for granting me the privilege to introduce the BioNatural Healing College (BNHC) E-Magazine June 2024 edition to our esteemed readers. Additionally, I extend my thanks to each one of you, especially our cherished readers, for your invaluable feedback and unwavering support. It's important to emphasize that the content within this magazine is intended solely for educational purposes, the author's perspectives are independent of any affiliation with BNHC.

We have high hopes that this BNHC E-Magazine will prove to be a valuable resource, made possible by the diligent contributions of esteemed researchers and colleagues from across the globe. With gratitude, I wish you all the best in health and a life filled with prosperity.

Warmest regards,

Dr. Nadir Sidiqi, Ph.D.

BioNatural Healing College

BioNatural Healing College Stands on Seven Core Pillar Foundations as follows:

1. All living organisms are made from the water this beautiful connection, connects us to praise the Creator of Creation for the provision of feeding, fueling, and healing to humanity.
2. No harm to public health and environmental health (Biodiversity) including pollinators, surface water, groundwater, soil, and air.
3. A series of complex chains involved with food production from the field to the mouth of the human body desperately needs scientific research to maximize healthy nutritionally food production and end malnutrition and food insecurity.
4. Harmful pests such as insects, and pathogens causing to human and plant health and loss of economic problems. BioNatural chemicals from plants, microorganisms, and ocean-living organisms exist and need further research to discover along with safety to utilize for the health improvement of humans as well as BioNatural Pest Management (insects, fungi, bacteria, various, nematodes, weeds, rodents, etc.).
5. Listen, love, appreciate, and respect with deep conscience and subconscious the connection between the genes of your body and beautifully ecologically in sense of feeling, feeding, fueling, and healing.
6. The brilliant human mind can irrigate with balance drinking clean water as a whole-body system to detoxify the toxicant from their body systems as well as to detoxify the soil, water, and environment from harmful chemicals, particularly pesticides through collaboration, and dedication from the individual, family, community, and scientific community locally and globally.
7. BioNatural Healing College provides a high-quality science base foundation through online education to fit and accommodate the needs of each prospective student for the sustainability and prosperity of his or her own, family, community, and humanity.

PHARMACOLOGICAL EFFECT OF MEDICINAL PLANT EXTRACT FOR HUMAN DISEASE PREVENTION

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Introduction: The study of medicinal plants, known as Pharmacognosy (obtaining drugs from medicinal plants, animals, fungi, and other natural sources), plays a crucial role in identifying bioactive molecules with therapeutic potential, fueling advances in pharmaceutical research and the development of new treatments for a wide range of diseases. As we delve deeper into the biochemistry of plants and their traditional uses, we unlock a wealth of possibilities for improving human health and shaping the future of medicine. The pharmacological effects of medicinal plant extracts can vary widely depending on the plant species and the specific compounds they contain here are some common pharmacological effects of medicinal plant extracts for human disease prevention.

Pharmacological Effects of Medicinal Plant Extracts:

1. **Antioxidant activity:** Many medicinal plants contain compounds such as flavonoids, polyphenols, and carotenoids, which exhibit antioxidant properties. These compounds help to neutralize harmful free radicals in the body, reducing oxidative stress and inflammation, and thereby preventing diseases like cancer, cardiovascular diseases, and neurodegenerative disorders (Lobo et al.,2010). Antioxidants play a crucial role in neutralizing oxidative stress. Oxidative stress occurs when there's an imbalance between free radicals and antioxidants in the body. Free radicals are unstable molecules that can damage cells and DNA, while antioxidants are molecules that neutralize them. Oxidative stress occurs when there are too many free radicals and not enough antioxidants. It, plays a significant role in the development of various diseases by damaging proteins, lipids, and DNA, leading to inflammation and cell death (Lien et al., 2008).

Some antioxidants can regenerate other antioxidants. For example, vitamin E can regenerate vitamin C, and glutathione can regenerate vitamin E. This interplay between antioxidants helps to maintain a pool of active antioxidants in the body, enhancing the overall antioxidant defense system (Traber et al., 2011). Antioxidants help suppress inflammation by inhibiting the production of pro-inflammatory molecules and signaling pathways. By reducing inflammation, antioxidants contribute to the prevention and management of conditions such as arthritis, inflammatory bowel disease, and asthma. Antioxidants, particularly those found in fruits, vegetables, and nuts, have been associated with a reduced risk of cardiovascular disease. They help protect against heart disease by reducing oxidative damage to blood vessels, lowering blood pressure, improving cholesterol levels, and inhibiting the formation of arterial plaques (Palanisamy et al., 2016). Medicinal plants, including green tea, turmeric, ginkgo biloba, amla, berries, rosemary, and cinnamon are rich sources of antioxidants that help combat oxidative stress, reduce inflammation, and promote overall health and well-being(Lima et al., 2011; Bhattacharya et al., 1999; Sung et al., 2000; Droy et al., 1997; Yasin et al., 2017; Olas et al., 2018). Green tea is derived from the leaves of the *Camellia sinensis* plant and is widely consumed for its health benefits. It contains high levels of polyphenols, particularly catechins such as epigallocatechin gallate (EGCG), which are potent antioxidants. Green tea polyphenols have been shown to scavenge free radicals, reduce oxidative stress, and protect cells from damage. Studies suggest that regular consumption of green tea may lower the risk of cardiovascular disease, improve blood sugar control, and reduce the risk of certain types of cancer(Musial et al., 2020). Turmeric is a bright yellow spice derived from the root of the *Curcuma longa* plant. Its active compound, curcumin, is a powerful antioxidant with strong anti-inflammatory properties. Curcumin scavenges free radicals, inhibits oxidative stress, and modulates various signaling pathways involved in inflammation and oxidative damage.

Research suggests that turmeric may help reduce the risk of chronic diseases such as heart disease, cancer, and neurodegenerative disorders. It also supports joint health, digestive function, and immune system function(Sharifi et al., 2020). *Ginkgo biloba*, commonly known as the maidenhair tree, is one of the oldest living tree species and has been used in traditional medicine for centuries. Its leaves contain flavonoids, terpenoids, and other antioxidants that help protect cells from oxidative damage. Ginkgo biloba extract has been shown to improve blood circulation, enhance cognitive function, and reduce oxidative stress in the brain. It may benefit individuals with conditions such as age-related cognitive decline, Alzheimer's disease, and peripheral artery disease. *Ginkgo biloba* also exhibits anti-inflammatory properties and may support eye health and cardiovascular function. Amla, also known as Indian gooseberry, is a fruit native to the Indian subcontinent and is revered in Ayurvedic medicine for its health benefits. It is exceptionally rich in vitamin C, which acts as a powerful antioxidant, scavenging free radicals and reducing oxidative stress. Amla also contains flavonoids, polyphenols, and tannins, which contribute to its antioxidant activity. Studies have shown that amla extract may help protect against oxidative damage to cells and tissues, support immune function, and promote cardiovascular health (Tabassum et al., 2022). Various berries, including blueberries, cranberries, and strawberries, are renowned for their antioxidant properties due to their high content of flavonoids, anthocyanins, and vitamin C. These compounds have potent antioxidant activity, scavenging free radicals and reducing oxidative stress throughout the body. Regular consumption of berries has been associated with a reduced risk of chronic diseases such as heart disease, cancer, and neurodegenerative disorders (Golovinskaia et al., 2021).

2. Anti-inflammatory Effects: Inflammation is a critical response to injury and infection but chronic inflammation is linked to various diseases, including arthritis, cardiovascular diseases, and cancer. Plant extracts can modulate inflammatory responses. Medicinal plants have long been used in traditional medicine for their therapeutic properties, including their ability to modulate inflammatory responses. The anti-inflammatory effects of several medicinal plants like turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), green tea (*Camellia sinensis*), Boswellia (*Boswellia serrata*), and licorice (*Glycyrrhiza glabra*) (Chen et al., 2017). The primary mechanisms by which these plants exert their anti-inflammatory effects include the inhibition of nuclear factor-kappa B (NF-κB) and mitogen-activated protein kinase (MAPK) pathways, suppression of cyclooxygenase (COX) and lipoxygenase (LOX) enzymes, and reduction of pro-inflammatory cytokines and oxidative stress. NF-κB Activation. In unstimulated cells, NF-κB is bound to its inhibitor IκB in the cytoplasm. Upon stimulation by inflammatory signals, IκB is phosphorylated and degraded, allowing NF-κB to translocate to the nucleus and initiate transcription of pro-inflammatory genes. Curcumin inhibits IκB kinase (IKK) activity, preventing the phosphorylation and subsequent degradation of IκB. This retention of IκB keeps NF-κB inactive in the cytoplasm, reducing the transcription of genes coding for cytokines (TNF-α, IL-1β, IL-6), adhesion molecules, and enzymes like COX-2(Yahfoufi et al., 2018). Suppression of COX-2 and LOX Enzymes. COX-2 catalyzes the formation of pro-inflammatory prostaglandins, while LOX enzymes are involved in the synthesis of leukotrienes, both of which are key mediators of inflammation.

Curcumin directly inhibits the expression and activity of COX-2 and 5-LOX, thereby reducing the levels of prostaglandins and leukotrienes. Curcumin reduces the production of pro-inflammatory cytokines like TNF-α, IL-1β, and IL-6 by inhibiting their gene expression through NF-κB pathway suppression and modulation of other signaling pathways.

Ginger (Zingiber officinale) extract shows anti-inflammatory properties by inhibiting the activity of COX-1, COX-2, and 5-LOX enzymes, leading to decreased synthesis of prostaglandins and leukotrienes, reducing inflammation. MAPKs are involved in cellular responses to stress and inflammation, regulating the production of pro-inflammatory cytokines. The active compound of Ginger is Gingerols and shogaols inhibit NF-κB activation by preventing the degradation of IκB and suppress MAPK pathway signaling, thereby reducing the expression of pro-inflammatory genes and cytokines. Ginger extracts lower the levels of TNF-α, IL-1β, and IL-6 by inhibiting their production through suppression of NF-κB and MAPK pathways(Zu et al., 2022).

3. **Anti-cancer effects:** Cancer remains a leading cause of morbidity and mortality worldwide, prompting ongoing research into new therapeutic agents. Medicinal plants have been a valuable source of anti-cancer compounds, offering a natural and often less toxic. The anti-cancer effects of various medicinal plant extracts, highlighting key examples such as turmeric (*Curcuma longa*), garlic (*Allium sativum*), and Mulberry (*Morus alba*), Ashwagandha plant (*Withaniasomnifera*). These compounds exert their effects through multiple molecular mechanisms, including the induction of apoptosis, inhibition of cell proliferation, suppression of angiogenesis, and modulation of key signaling pathways such as NF-κB, PI3K/Akt, MAPK, and Wnt/β-catenin. Plant extracts promote cancer cell apoptosis, inhibit angiogenesis, and modulate signaling pathways involved in cell proliferation and survival (Greenwell et al., 2015). Curcumin, the active compound of *Curcuma longa* promotes programmed cell death (apoptosis) in cancer cells through various mechanisms, including activation of caspases, upregulation of pro-apoptotic proteins (e.g., Bax), and downregulation of anti-apoptotic proteins (e.g., Bcl-2). This leads to the elimination of cancerous cells and the inhibition of tumor growth.

Curcumin suppresses cancer cell proliferation by interfering with the cell cycle progression. It modulates the expression and activity of cell cycle regulators such as cyclins and cyclin-dependent kinases (CDKs), leading to cell cycle arrest at various checkpoints, particularly the G1 phase. Angiogenesis, the formation of new blood vessels, is crucial for tumor growth and metastasis. Curcumin inhibits angiogenesis by suppressing the expression and activity of angiogenic factors such as vascular endothelial growth factor (VEGF) and matrix metalloproteinases (MMPs), thereby depriving tumors of essential nutrients and oxygen(Giordano et al., 2019). Curcumin attenuates cancer cell invasion and metastasis by modulating various signaling pathways involved in epithelial-mesenchymal transition (EMT), cell adhesion, and migration. It inhibits the expression of matrix metalloproteinases (MMPs) and reduces the activity of factors promoting metastatic spread. Curcumin targets multiple signaling pathways dysregulated in cancer, including NF-κB, PI3K/Akt, MAPK, and Wnt/β-catenin pathways. By inhibiting the activation of these pathways, curcumin suppresses pro-inflammatory cytokines, promotes apoptosis, and impedes tumor progression(Lee et al., 2015). Allicin is a compound found in garlic (*Allium sativum*). Allicin has been shown to inhibit the proliferation of various kinds of cancer, including those of the colon, stomach, breast, and prostate. It interferes with cellular processes involved in cancer cell growth and division. Allicin induces apoptosis in cancer cells through the activation of caspases, which are enzymes involved in the apoptotic pathway. This leads to the controlled death of cancer cells, preventing their uncontrolled growth and spread. Angiogenesis, the formation of new blood vessels, is crucial for tumor growth and metastasis. Allicin has been shown to inhibit angiogenesis by suppressing the expression of vascular endothelial growth factor (VEGF) and other pro-angiogenic factors, thereby depriving tumors of their blood supply(Omar et al., 2010). Allicin inhibits cancer metastasis by interfering with the migration and invasion of cancer cells.

It suppresses the activity of enzymes involved in extracellular matrix degradation, thereby hindering the ability of cancer cells to invade surrounding tissues and metastasize to distant sites. Allicin interferes with various signaling pathways implicated in cancer development and progression, including the PI3K/Akt, MAPK, and Wnt/β-catenin pathways. By modulating these pathways, allicin exerts its anticancer effects by inhibiting cell survival, proliferation, and metastasis(Zhang et al., 2019). The mulberry extract shows potential anticancer effects against various cancers, including colon, liver, breast, and leukemia. It inhibits cancer cell proliferation, induces apoptosis, and modulates cancer-related signaling pathways. Mulberry extract activates caspases and mitochondrial pathways, leading to apoptosis in cancer cells. Mulberry extract suppresses the PI3K/Akt pathway, which promotes cell survival and proliferation in cancer. Mulberry extract inhibits angiogenesis by suppressing the expression of angiogenic factors like VEGF (Ghavami et al., 2020). Ashwagandha extract exhibits anticancer effects against various cancers, including breast, colon, lung, and ovarian cancer. It inhibits cancer cell proliferation, induces apoptosis, and enhances the immune response against cancer cells. Ashwagandha extract enhances natural killer cell activity and promotes immune surveillance against cancer cells. Ashwagandha, extract suppresses the expression of metastasis-related genes and inhibits cancer cell migration and invasion(kiran et al., 2012). **4. Anti-diabetic Activity:** The antidiabetic activity of medicinal plant extracts has been a subject of considerable research, particularly focusing on their potential to manage or treat diabetes mellitus through various molecular mechanisms. Medicinal plants have been used traditionally to manage diabetes, and numerous studies have validated their efficacy. Some notable plants with antidiabetic properties include *Momordica charantia* (Bitter Melon), Known for its insulin-like compounds, which help in reducing blood glucose levels.

Trigonella foenum-graecum (Fenugreek), Contains soluble fiber which helps control blood sugar levels. *Gymnema sylvestre*, known as a "sugar destroyer," can reduce sugar absorption in the intestines(Patel et al., 2012). Cinnamon (*Cinnamomum verum*), Contains compounds that improve insulin sensitivity and glucose uptake. Aloe vera contains compounds like aloesin which have been shown to lower blood glucose levels. The molecular mechanisms by which these plants exert their antidiabetic effects by enhancing Insulin Secretion. Some plant extracts can stimulate the pancreas to secrete more insulin. For instance, *Gymnema sylvestre* has been shown to increase the regeneration of islet cells and stimulate insulin secretion. Compounds like cinnamaldehyde in Cinnamon improve the insulin receptor's responsiveness, enhancing glucose uptake by cells (Qin et al., 2010). Berberine, found in plants like *Berberis vulgaris*, activates AMP-activated protein kinase (AMPK), which improves insulin sensitivity and promotes glucose uptake in muscle cells. Some plants reduce the breakdown and absorption of carbohydrates in the intestine. *Momordica charantia* has been found to inhibit alpha-glucosidase and alpha-amylase enzymes, reducing postprandial blood glucose levels. Metformin, a compound derived from the plant *Galega officinalis*, reduces hepatic glucose production. Similar mechanisms are observed in other plant extracts that inhibit gluconeogenesis (Lee et al., 2006). **5. Cardioprotective Activity:** The cardioprotective activity of medicinal plants is a well-researched area, with numerous plants showing potential in preventing and managing cardiovascular diseases (CVD).

The cardioprotective plants contain a variety of bioactive compounds, including diosgenin, isoflavones, sulforaphane, carotinized, catechin, and quercetin, have been proven to enhance cardio-protection, hence reducing the risk of cardiac abnormalities. Heart attacks, also called myocardial infarction (MI), and related complications are the main causes of death throughout the world. The use of herbal antioxidants is, increasing as a defensive agent against several cardiovascular abnormalities (Shah et al., 2019). Medicinal plants such as *Daucus carota Linn*, *Nerium oleander* Linn, *Amaranthus viridis*, *Ginkgo biloba*, *Terminalia arjuna*, *Tinospora cordifolia*, *Hydrocotyle asiatica* Linn, *Mucuna pruriens*, and *Cichorium intybus* are known to have cardioprotective potential. *Digitalis lanata* is one of the oldest medicinal plants widely used for the treatment of cardiac diseases and the most active constituent present in it is a steroid glycoside called digoxin. Digoxin was also found to be used for the treatment of arrhythmia. Another plant *Atropa belladonna* contains atropine, which is being used for slow heart rate (bradycardia) (Sheshadri et al., 2021). The cardioprotective effect of medicinal plants during cardiovascular ailments has been demonstrated by attenuating the damage in cardiac muscle cells, vascular smooth muscle cells (VSMCs), endothelial cells (ECs), and macrophages and monocytes. In cardiomyocytes (heart muscle cells) the effect of medicinal plant extract shows by opening of KATP channels (potassium channels that regulate cellular excitability), Increased secretion of atrial natriuretic peptide (a hormone that regulates blood pressure and fluid balance), attenuation of cardiac hypertrophy (enlargement of the heart) and oxidative stress, inhibition of apoptosis (cell death) in cardiac cells (Shah et al., 2019). In Endothelial Cells (cells lining blood vessels), beneficial effects of medicinal plants have been shown by inhibition of inflammation, oxidative stress, and apoptosis.

Activation of the endothelial nitric oxide synthase-nitric oxide (eNOS-NO) signaling pathway, which promotes vasodilation and cardiovascular health. Induction of angiogenesis (formation of new blood vessels) and suppression of endothelial permeability (leakiness of blood vessels). In Vascular Smooth Muscle Cells (cells in the walls of blood vessels) medicinal plants ' beneficial effects have been shown through the expression, inhibition, or activity of structural and contractile proteins, modulation of extracellular matrix proteins/glycoproteins expression (Adetunji et al., 2023). Regulation of calcium levels, which play a crucial role in muscle contraction. Alleviation of inflammation and attenuation of proliferation and migration of smooth muscle cells. Improvement of mitochondrial function, which is essential for cellular energy production (Pan et al., 2019).Activation of estrogen receptors, which may have protective effects on the cardiovascular system. Inhibition of the NOS-NO signaling pathway in macrophages and monocytes, which can regulate inflammation and vascular function. Activation of the nuclear receptor peroxisome proliferator-activated receptor alpha (PPARα), which plays a role in lipid metabolism and inflammation regulation. These mechanisms collectively contribute to the cardioprotective effects of medicinal plants and herbal products by preserving the function and structure of cardiac and vascular cells, reducing inflammation, and improving overall cardiovascular health(Tokiwa et al., 2023). **6. Neuroprotective activity:** Neuroprotection is a term used to refer to strategies and relative mechanisms that shield the central nervous system (CNS) from neuronal injuries caused by chronic (e.g., Alzheimer's and Parkinson's diseases) or acute (e.g., stroke) neurodegenerative diseases (NDs). Nature remains to be a veritable source of medicine to mankind.

Many important drugs such as vincristine, artemisinin, and gentamicin, which are still in use today, are obtained from natural sources or are designed on structural fingerprints of naturally occurring molecules (Elufioye et al., 2017). Numerous natural products, but primarily plant extracts, have been reported to be used in traditional medicine for neuroprotective, memory-enhancing, and anti-aging purposes. Examples of such plants include *Ginkgo biloba*, *Panax ginseng*, *Curcuma longa*, *Bacopa monnieri*, and *Salvia officinalis*. *Ginkgo biloba* extract exhibits neuroprotection by several mechanisms that include inhibition of membrane lipid peroxidation, anti-inflammatory effects, and direct inhibition of amyloid-b aggregation and anti-apoptotic activities (Akram et al., 2017). The flavonoid fraction of *Ginkgo biloba* (*G. biloba*) extract is responsible for the antioxidant and free-radical scavenging properties and bilobalide can reduce damage caused by global brain ischemia and excitotoxicity-induced neuronal death. *G. biloba* extract significantly inhibits the Acetylcholinesterase (AChE) activity in the brain which indicates an increase in the basal level of acetylcholine. Flavonoids alter several biological processes their interactions with neuronal and signaling pathways, expression of proteins required for synaptic plasticity and repair, changes in cerebral blood flow, and inhibition of neuropathological processes in certain brain regions (Shi et al., 2010). A study showed that the extract of *G. biloba* inhibits the production of brainamyloid-β proteins (Aβ) levels by lowering cholesterol, as free and circulating free cholesterols that affect amyloidogenesis. It may also influence the formation of Aβ fibrils by increasing gene expression of transthyretin that prevents Aβ aggregation in vitro. *Panax ginseng* extract may protect against neurodegeneration by multiple mechanisms. The ginsenosides improve performance in neuroprotection due to their ability to suppress cellular AChE activity and enhancement of cholinergic metabolism. It also produces a dose-dependent reduction in the β-amyloid deposition or glutamate-induced excitotoxicity, thereby preventing apoptosis and neuronal death(Singh et al., 2019).

Acorus calamus contains a majority of α-and β-asarone, β-asarone has the capability of suppressing beta-amyloid-induced neuronal apoptosis in the hippocampus by reversal down-regulation of Bcl-2, Bcl-w, caspase-3 activation, and c-Jun N-terminal kinase (JNK) phosphorylation. Methanolic extracts of the roots containing α-asarone showed an inhibitory effect on AChE. *Acorus calamus* has the potential to improve the function of the dopaminergic nerve, by increasing striatal extracellular dopamine levels (Balakrishnan et al., 2022). **7. Hepatoprotective activity:** The liver plays a critical role in detoxification, metabolism, and overall homeostasis, making it vulnerable to various toxins and diseases. Certain plants have been traditionally used and scientifically validated for their hepatoprotective properties, which safeguard the liver from damage. Notably, *Silybum marianum* (Milk Thistle) and *Phyllanthus niruri* (*Chanca Piedra*) are recognized for their liver-protective effects. *Silybum marianum* contains silymarin, a complex of flavonolignans, known for its potent antioxidant and anti-inflammatory activities. Silymarin stabilizes hepatocyte membranes, enhances glutathione production, and inhibits lipid peroxidation, thereby protecting liver cells from oxidative stress and promoting liver regeneration (Gillesen et al., 2020). *Phyllanthus niruri* contains lignans, flavonoids, and alkaloids, which contribute to its hepatoprotective effects. The plant's compounds exhibit antioxidant properties, reduce inflammation, and inhibit the replication of the hepatitis B virus, reducing viral load and liver inflammation. These mechanisms support liver cell health and facilitate tissue repair and regeneration. Silymarin scavenges free radicals, reducing oxidative stress on liver cells. Silymarin reduces liver inflammation by inhibiting inflammatory cytokine, Promotes the regeneration of liver cells, prevents toxins from binding to liver cell membranes, protecting the liver from damage.

Silymarin stabilizes the cell membrane of hepatocytes (liver cells), preventing the entry of toxins. It enhances the production of glutathione, a crucial antioxidant in liver detoxification processes. Silymarin inhibits lipid peroxidation, thus protecting liver cells from damage caused by free radicals (Geethangili et al., 2020). Compounds in *Phyllanthus niruri* reduce oxidative stress by neutralizing free radicals. It inhibits pro-inflammatory enzymes and cytokine and protects against chemically-induced liver damage and supports liver cell health. It has been found to show to be effective against hepatitis B virus, reducing viral load and liver inflammation. Compounds in *Phyllanthus niruri* protect liver cells by enhancing antioxidant defenses and reducing oxidative stress. They inhibit the replication of the hepatitis B virus, which can reduce liver damage associated with viral hepatitis. The plant's extracts support the repair and regeneration of liver tissue by modulating various cellular pathways involved in inflammation and cell survival (Amin et al., 2012). **8. Antimicrobial Properties:** Plant extracts have been used for centuries in traditional medicine for their antimicrobial properties. These extracts contain a variety of bioactive compounds that can inhibit the growth of bacteria, fungi, viruses, and parasites, thereby preventing human diseases. Antimicrobial properties of some commonly studied plant extracts and their potential applications in preventing human diseases are utilized in different ways. The active Compounds of garlic *(Allium sativum)*are Allicin, diallyl sulfides. These compounds show antimicrobial activity against bacteria (e.g., MRSA, *Escherichia coli*), fungi (e.g., Candida species), and viruses. Tea tree oil (Melaleuca alternifolia) shows antimicrobial Activity by its active compound Terpinen-4-ol, α-terpineol effective against bacteria (e.g., Staphylococcus aureus), fungi (e.g., Candida albicans), and some viruses. This compound is used in topical treatments for acne, athlete's foot, and other skin infections; included in hygiene products(Bittner et al., 2021).Echinacea (*Echinacea purpurea*) exhibits immunomodulatory and antimicrobial effects against bacteria and viruses and helps in the prevention and treatment of respiratory infections, such as the common cold and flu.

Turmeric (*Curcuma longa*) shows antibacterial, antifungal, and antiviral properties. It is issued for gastrointestinal infections, skin infections, anti-inflammatory treatments, and cancer prevention. Cranberry (*Vaccinium macrocarpon*) prevents bacterial adhesion, particularly E. coli, to urinary tract walls. It prevents urinary tract infections (UTIs) (Catanzaro et al., 2018). Neem (*Azadirachta indica*) shows activity against bacteria, fungi, and viruses and helps in the treatment of skin disorders, dental hygiene, and as an insect repellent. Aloe Vera (*Aloe barbadensis*) is effective against various bacteria and fungi and used for wound healing, skin infections, and burns. Many plant compounds, such as essential oils, can disrupt microbial cell membranes, causing cell lyses. Certain compounds inhibit key enzymes required for microbial growth and metabolism. Some plant extracts interfere with DNA or RNA synthesis, preventing microbial replication. Several plant extracts enhance the immune system's ability to fight off infections. The antimicrobial properties of plant extracts offer promising natural alternatives to synthetic antimicrobials. Their application in preventing and treating diseases is supported by both traditional use and modern scientific research, providing effective, safe, and sustainable options for enhancing human health (Wylie et al., 2022). **9. Analgesic Properties:** Medicinal plants have been used for centuries to alleviate pain and other ailments. Their analgesic properties often derive from bioactive compounds that interact with the body's physiological processes to reduce the sensation of pain. The active compound of *Willow Bark* (*Salix* spp.) is Salicin, which is metabolized in the body to salicylic acid, which is chemically similar to aspirin.

It inhibits the cyclooxygenase (COX) enzymes COX-1 and COX-2, reducing the production of prostaglandins, which are involved in pain and inflammation. Curcumin is the active compound of turmeric (*Curcuma longa*). Curcumin exerts anti-inflammatory and analgesic effects by inhibiting the activity of nuclear factor-kappa B (NF-κB), a protein complex that controls the transcription of DNA, cytokine production, and cell survival. It also modulates the levels of various inflammatory cytokines and enzymes such as COX-2 and LOX (Rengasamy et al., 2021). Capsaicin, an active compound of Capsaicin (*Capsicum spp*.), binds to the transient receptor potential vanilloid 1 (TRPV1) receptor, which is involved in sensing pain and heat. This binding leads to the desensitization of sensory neurons, reducing pain signaling. Parthenolide is an active compound found in Feverfew (*Tanacetum parthenium*). Feverfew inhibits the synthesis of prostaglandins and other inflammatory mediators by inhibiting the activity of COX-2 and phospholipase A2. It also affects serotonin release, which can influence pain perception, particularly in migraine sufferers. The active compound Eugenol is derived from the plant, Clove (*Syzygium aromaticum*). Eugenol has analgesic and anti-inflammatory properties. It acts as a local anesthetic by blocking the conduction of nerve impulses through the inhibition of voltage-gated sodium channels (Fattori et al., 2016). Gingerols and Shogaols are derived from Ginger (*Zingiber officinale*). These compounds exhibit anti-inflammatory and analgesic effects by inhibiting the synthesis of prostaglandins and leukotrienes through suppression of COX and LOX pathways. Gingerols also reduce the levels of pro-inflammatory cytokines. Cannabis (*Cannabis sativa*) produces active compounds, Cannabinoids (THC, CBD). THC (tetrahydrocannabinol) and CBD (cannabidiol) interact with the endocannabinoid system, specifically the CB1 and CB2 receptors. This interaction modulates pain perception and reduces inflammation. THC primarily binds to CB1 receptors in the brain, affecting pain signaling and perception, while CBD modulates inflammatory responses by acting on CB2 receptors. Medicinal, plants offer a variety of compounds that can effectively reduce pain through different mechanisms. These range from inhibiting enzymes that produce inflammatory mediators to modulating receptor activity involved in pain perception (Kim et al., 2023).

10. Antipyretic Properties: Antipyretic properties refer to the ability of substances to reduce fever. Many medicinal plants exhibit antipyretic effects, which are often utilized in traditional medicine. The mechanisms by which these plants exert their antipyretic effects can vary but generally involve interactions with the body's thermoregulatory pathways, inflammatory mediators, and other biochemical processes. Salicin, which is metabolized into salicylic acid, inhibits the enzyme cyclooxygenase (COX), reducing the production of prostaglandins, which are responsible for causing fever and inflammation. Nimbin, nimbidin, and azadirachtin, these compounds exhibit antipyretic effects by inhibiting the synthesis of prostaglandins and reducing inflammation (Aronoff et al., 2001). Ginger (*Zingiber officinale*). Eugenol, ursolic acid, and rosmarinic acid, these compounds reduce fever by inhibiting COX enzymes and reducing the levels of pro-inflammatory cytokines. Menthol and rosmarinic acid act on TRPM8 receptors, which can induce a cooling sensation and help, reduce fever. Rosmarinic acid has anti-inflammatory effects that contribute to its antipyretic properties (Mao et al., 2019). Many antipyretic plants contain compounds that inhibit cyclooxygenase (COX) enzymes, particularly COX-2, which play a critical role in the synthesis of prostaglandins. Prostaglandins are lipid compounds that mediate inflammation and fever by acting on the hypothalamus, the brain's thermoregulatory center. Fever often results from an inflammatory response. Medicinal plants with antipyretic properties frequently exhibit anti-inflammatory effects by inhibiting the production of inflammatory cytokines such as IL-1, IL-6, and TNF-α. This leads to a decrease in the inflammatory response and, consequently, a fever reduction (Zarghi et al., 2011). Some antipyretic plants exert their effects through antioxidant mechanisms. Oxidative stress can contribute to the inflammatory process, and antioxidants can help mitigate this, reducing the overall inflammatory response and fever.

Certain plant compounds can directly affect the body's thermoregulatory pathways. For example, menthol from peppermint acts on TRPM8 receptors, creating a sensation of cooling and potentially lowering body temperature (Kasote et al., 2015). Some antipyretic plants may influence the hypothalamic-pituitary-adrenal (HPA) axis, which plays a role in the body's response to stress and inflammation. By modulating this axis, these plants can help regulate body temperature. The antipyretic properties of medicinal plants are primarily attributed to their ability to inhibit prostaglandin synthesis, reduce inflammation, and modulate thermoregulatory pathways. These effects are mediated by various bioactive compounds present in the plants, which often exhibit multiple mechanisms of action to achieve their antipyretic effects (Adegbola et al., 2017).

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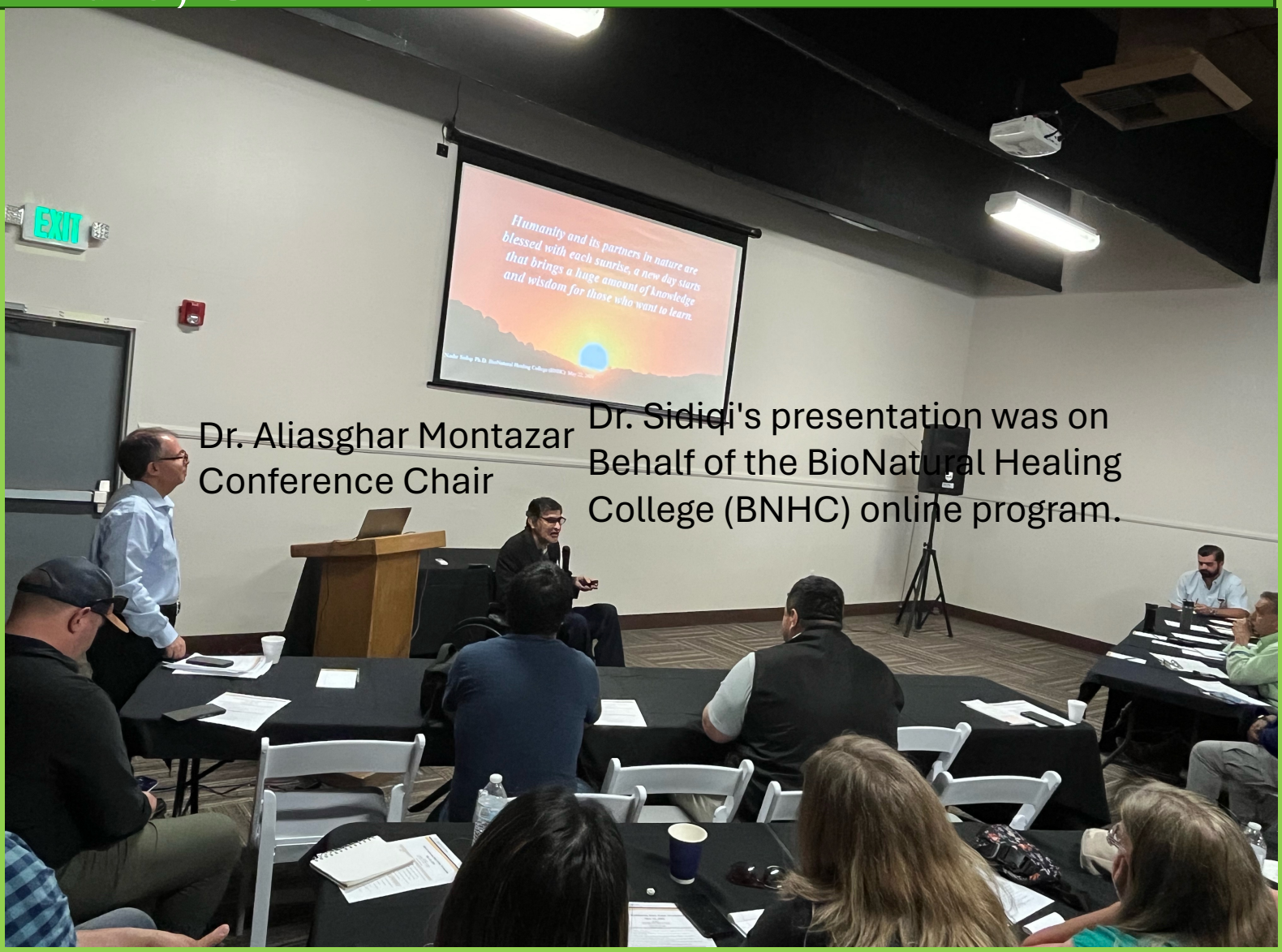
Conference/Workshop: 2024 California Date Palm Workshop May 22, 2024, Organized by the University of California Agriculture and Natural Resources Dr. Nadir Sidiqi Ph.D was an invited speaker Indio, California.



Dr. Aliasghar Montazar
Conference Chair

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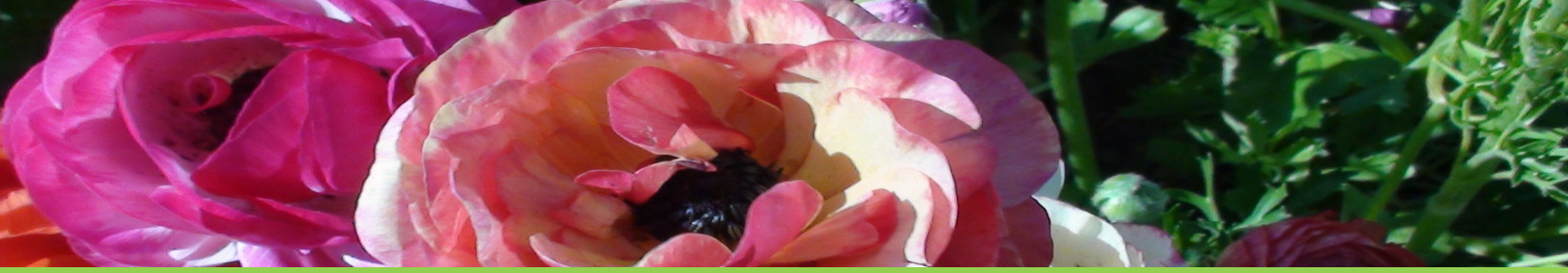

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Vision: The faculty, staff and management team of BioNatural Healing College are passionately committed to providing the best teaching possible in this field. We seek to encourage, motivate and explain the importance of this field to prospective students so that they may make an informed decision regarding enrollment. We seek an ultimate goal of satisfaction for the student based on responsibility, commitment, respect, awareness and sustainable education for society.

Accreditation and Recognition: BioNatural Healing College is based in California. It is an institution that has the goal to deliver on- demand online distance learning around the globe. This education is of high quality and vocational in nature. BioNatural Healing College is a legal business entity that has been approved to operate by the State of California's Bureau for Private Postsecondary Education that set forth in the educational code. BioNatural Healing College is not accredited by the United States Department of Education. BioNatural Healing College is a member of the American Holistic Health Association (AHHA).

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