**INTERNATIONAL RESEARCH JOURNAL OF PHARMACY** **ISSN 2230 – 8407**
**Available online** http://www.irjponline.com
**Review Article**

# IS LIFE-SPAN UNDER OUR CONTROL??

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Article Received on: 11/11/10 Revised on: 20/12/10 Approved for publication: 30/12/10

**ABSTRACT**
With each passing day, we age. Our body gets flooded with unwanted and deleterious elements, our cells lose their ability to divide, our nervous, endocrine and immune systems weaken with advancing age. Sagging skin, wrinkled face, graying hair, loss of muscle strength, reduced reflexes, low energy levels, increasing fat, faulty memory (dementia), weak immunity, impaired vision, defective hearing, decreased libido, cardiovascular problems and neurodegenerative disorders (like Parkinsonism and Alzheimer's disease) are the characteristic features of ageing. Leading a disease free, long life (longevity) has been a dream of mankind since the arrival of human race on the planet Earth. We can not reverse the ageing process, but the features associated with ageing can be delayed in order to improve the quality of life. The present review article focuses on different theories of ageing and the anti-ageing effects of Green tea, Garlic, Turmeric, Ashwagandha, Tomato, Anwala, Ginger, Aloe and Tulsi.

**KEYWORDS:** Anwala, Ashwagandha, Garlic, Ginger, Green tea, Turmeric

## INTRODUCTION

Ageing is a continuous, universal, progressive, intrinsic and deleterious process, which decreases an organism's ability to maintain homeostasis in the face of environmental stressors. Thus the ageing process enhances the likelihood of dying.[1,2] Sagging skin, wrinkled face, graying hair, loss of muscle strength, reduced reflexes, low energy levels, increasing fat, faulty memory (dementia), weak immunity, impaired vision, defective hearing, decreased libido, cardiovascular problems and neurodegenerative disorders (like Parkinsonism and Alzheimer's disease) are the characteristic features of ageing. Ageing maintains no partiality among men or women. Both the genders are equally susceptible to ageing as signalled by menopause in women and diminished secretion of sex hormones in men. Furthermore, ageing process affects almost all mammalian species including mice with the life span of just one year to human beings capable of living over 100 years.[3]

## THEORIES OF AGEING

### Free Radical Theory

In 1956, Denham Harman suggested that free radicals produced during aerobic respiration cause cumulative oxidative damage, resulting in ageing and subsequent death of an organism. He noted parallels between the effects of ageing and of ionizing radiation, including mutagenesis, cancer and gross cellular damage.[4] The term free radical describes any molecule that has a free electron, and this property makes it react with healthy molecules in a destructive way. The free radical theory supposes that ageing is the result of accumulated errors from excessive free radical generation causing oxidative modification of DNA, proteins and lipid molecules. These all deleterious effects cause structural damage to our cells and greatly increase the severity of life-threatening diseases such as diabetes, stroke, heart problems and cancer. Since longer-lived species have lower rates of free radical generation than do shorter-lived ones, therefore, life span may be dependent upon our ability to prevent oxidative damage from free radicals.[2,5]

**Cellular Senescence /Telomere Theory**

The cellular senescence theory of ageing was formulated in 1965, when cell senescence was described by the process that limits the number of cell divisions, a normal human cell can undergo in culture. This 'limit in replicative capacity' occurs after characteristic number of cell divisions and results in terminally arrested cells with altered physiology. Replicative senescence is a specific type of cellular senescence that ultimately results from loss of telomeres. Telomeres are tiny caps with repeating DNA sequence 5'-$(TTAGGG)_n$-3' and located at the ends of each linear chromosome that keep our chromosomes indispensable for successful segregation and for protection of chromosome ends against degradation. As we grow and age, our cells divide. One parent cell divides into two daughter cells, making copies of the genetic information to pass on to these new cells. When we are young, the telomeres are very long and the number of uninterrupted repeats in telomeres of human chromosome is about $2.3 \times 10^3$. Each time a cell divides and the DNA within the cell is copied, the telomeres shorten. This process continues until the telomeres reach a critical length, at which point the cell stops dividing. Once a cell stops dividing, it may do one of three things: die, become inactive, or transform into some sort of abnormality, such as a cancerous cell. On the basis of regular shortening, telomeres are characterized as a mitotic clock that limits the number of cell divisions normal human cells can undergo. This limit in replicative capacity occurs after a characteristic number of cell divisions and ultimately results in cellular senescence. This cellular senescence causes cells to enlarge and exist for sometime before gradually dying.[6]

**Evolutionary Theories of Ageing**

Evolutionary theories argue that ageing results from a decline in the force of natural selection. Because evolution acts primarily to maximize reproductive fitness in an individual, longevity is a trait to be selected only if, it is beneficial for fitness. Life span is therefore, the result of selective pressures and may have a large degree of plasticity within an individual species, as well as among species.[5] The evolutionary theory was first formulated in 1940s based on the observation that Huntington's disease, a dominant lethal mutation remained in the population even though, it should be strongly selected against. The late age of onset for Huntington's disease (30–40 yr) allows a carrier to reproduce before dying, thereby allowing the disease to avoid the force of natural selection. In other words, the somatic organism is effectively maintained only for reproductive success; afterwards it is disposable. For example, in humans, the growth and normal function of prostate gland are promoted by androgens, the male gonadal hormones. In old age, these same hormones may contribute to the etiology of prostate cancer, one of the major causes of death in old men.[5]

**Neuroendocrine and Immune Theory**

In humans, all systems may be considered indispensable for survival. However, the nervous, endocrine and immune systems play a key role by their ubiquitous actions in coordinating all other systems and in their interactive and defense responsiveness to external stimuli. Neuroendocrine theory proposes that ageing is due to changes in neural and endocrine functions. These changes, not only selectively affect the neurons and hormones that regulate evolutionarily significant functions such as reproduction, growth, and development, but also affect those that regulate survival through adaptation to stress. An important composition of this theory is the perception of the hypothalamus-pituitary-adrenal (HPA) axis as the master regulator. The major function of HPA axis is to muster the physiological adjustments necessary for preservation and maintenance of the internal homeostasis, despite the continuing changes in the environment. The hormones secreted by the HPA axis are regulated by positive and negative feedback between the target hormones and their central control by the pituitary and hypothalamus. With ageing and in response to continuing and severe stress not only feedback mechanisms may be impaired, but also glucocorticoids themselves may become toxic to neural cells, thus disrupting feedback control and hormonal cyclicity. Moreover, a reduction in sympathetic responsiveness is also seen with ageing, which is characterized by the decreased number of catecholamine receptors in the peripheral target tissues. Parallel to neuroendocrine interactions, the immune system has several essential functions. In most elderly humans, immune-senescence is characterized by a decreased resistance to infectious diseases, a decreased protection against cancer and an increased failure to recognize self. The thymus is one of the most important immune organs, which is involved in the selection and maturation of T cells and production of peptide hormones. The thymus reaches a peak in both size and function during puberty.

Shortly thereafter, it atrophies and progressively reduces its production of mature T cells and hormones. During life span, chronic exposure to severe stress from a multitude of physical, biological or emotional stimuli may exhaust or weaken the capacity to adapt and lead to so called 'diseases of adaptation' and death. Ageing would then result from ' decreased ability to adapt' one of the many definitions of ageing that suggests a close relationship between stress and longevity. Medicines derived from plants have played a pivotal role in the health care of many societies, both ancient and modern. In the foregoing pages, we have described in detail the anti-ageing effects of Green tea, Garlic, Turmeric, Ashwagandha, Tomato, Anwala, Ginger, Aloe and Tulsi.

**GREEN TEA**

**Biological Source**- Green tea is derived from the leaves of the plant *Camellia sinensis* belonging to Theaceae family.

**Geographical Source**- Tea is one of the most popular beverages consumed worldwide, as green, black or Oolong tea. About three billion kilograms of tea is produced and consumed yearly. Green tea is mainly consumed in Japan, China and India. Of the tea produced worldwide, 78% is black tea, which is usually consumed in the Western countries, 20% is green tea, which is commonly consumed in Asian countries, and 2% is Oolong tea which is produced (by partial fermentation) mainly in southern China. In India, tea is cultivated in Eastern region mainly in Assam.

**Chemical Constituents-** The beneficial effects of green tea are attributed to the polyphenolic compounds, particularly the catechins. These catechins are present in higher quantities in green tea than in black or oolong tea, because of differences in the processing of tea leaves after harvest. For green tea, fresh tea leaves from the plant are steam-dried to inactivate the polyphenol oxidase enzyme, a process that essentially maintains the polyphenols in their monomeric forms. Black tea, on the other hand, is produced by extended fermentation of tea leaves which results in the polymeric compounds, thearubigins and theaflavins. Oolong tea is a partially fermented product and contains a mixture of the monomeric polyphenols and higher molecular weight theaflavins. All three varieties of tea contain significant amounts of caffeine, which is unaffected by different processing methods. There are several polyphenolic catechins in green tea, viz. catechin, epicatechin (EC), epicatechin-3-gallate (ECG), epigallocatechin (EGC), epigallocatechin-3-gallate (EGCG), and gallocatechin (GC). EGCG, the most abundant catechin in green tea, accounts for 65% of the total catechin content. A cup of green tea may contain 100–200 mg of EGCG. Catechin and gallocatechin are present in trace amounts.[7]

**Anti-ageing Effects-** Tea is a pleasant, popular, socially accepted, economical and safe drink that is enjoyed every day by millions of people all over the world. Recent studies point out tea as "Nature's Wonderful Gift" for promoting human health and social interaction. Tea constituents exert their effects at the cellular level. Green tea catechins are best known for their antioxidant properties, useful in a number of diseases such as cancer, cardiovascular and neurodegenerative diseases. The radical quenching ability of green tea is usually higher than that of black tea. Among tea catechins, EGCG is the most effective in scavenging reactive oxygen species. Daily consumption of green tea may help in prolonging life by avoiding premature death.[8] The beneficial effects of tea on cardiovascular system include vasculoprotective, antioxidant, antithrombotic, anti-inflammatory and lipid lowering properties of tea flavonoids. Its intake decreases the absorption of triglycerides and cholesterol.[9] The effects of tea on obesity and diabetes have received increasing attention. Tea catechins, especially EGCG, appear to have anti-obesity and anti-diabetic effects through the modulations of energy balance, endocrine systems, food intake, lipid and carbohydrate metabolism and the redox status.[10] Tea improves neurological and psychological functions. Tea possesses excellent mood elevating and refreshing property, which makes it a favorite drink not only in homes but also in offices. Green tea improves short-term memory, learning ability and affects emotions. Furthermore, it may be useful in Parkinson disease, Alzheimer's disease and stroke. Tea consumption also protects against the risk of hip fractures in men and women, by increasing bone mineral density. Tea can exert beneficial effects against bacterial as well as viral infections. It has been reported that EGCG has favorable effects on HIV infection and *Staphylococcus aureus* infections.[11]

**GARLIC**

**Synonyms-** It is most commonly known as garlic. Ail, ajo, lahsun, lasuna, majo, seer, tellagada and vallaippundu are some other common names in different Indian languages.

**Biological Source**- Garlic is derived from the bulbs of the plant known as *Allium sativum* belonging to family Liliaceae. Garlic has been renowned for its medicinal properties throughout history.

**Geographical Source-** It is indigenous to Asia, from where it spread to other continents. It is cultivated in Central Asia, southern Europe, USA and India. In India, it is used in almost all the states as a spice or condiment.

**Special Features-** Garlic is consumed in different types of preparations; out of which garlic essential oil, garlic oil macerate, garlic powder and garlic extract are the most popular. Aged garlic extract (AGE) has a reproducible array of components, which have been analyzed and studied extensively for their high antioxidant content and disease-protective potential. In many recent clinical studies, the daily dose of dehydrated garlic powder has been ~900mg. No severe toxic/side effects were reported for garlic products even at high doses.[12]

**Chemical Constituents**- Garlic bulbs contain amino acids, vitamins, trace metals, flavonoids, enzymes and at least 200 other compounds. Garlic contains unique organosulfur compounds[13], which impart its characteristic flavor and odor. The major unique organosulfur compounds in AGE are water-soluble and lipid soluble. Water soluble compounds are *S*-allylcysteine (SAC) and *S*-allylmercaptocysteine (SAMC), and lipid-soluble compounds in AGE include diallyl sulfide (DAS), triallyl sulfide, diallyl disulfide (DADS), diallyl olysulfides. The content of SAC and SAMC in AGE is high because they are produced during the process of ageing, thus providing AGE with higher antioxidant activity than fresh garlic. Other antioxidants in AGE include phenolic compounds, notably allixin, *N*-fructosyl glutamate, *N*-fructosyl arginine and selenium, as well as the organosulfur compounds.

**Anti-ageing Effects-** Many favorable experimental and clinical effects due to the consumption of garlic preparations have been reported. These effects strongly suggest that AGE may have an important role in lowering the risk of cardiovascular disorders, cancer, Alzheimer's disease and other age-related degenerative conditions. The underlying mechanism of action for its anti-ageing effect has been ascribed to its potent antioxidant action, its ability to stimulate immunological responses and its modulation of prostanoid synthesis.[13] AGE also inhibits lipid oxidation and oxidative modification of LDL. In this way, AGE may reduce the amount of circulating oxidized LDL and the subsequent accumulation of cholesterol in macrophages, smooth muscles and blood vessel walls, resulting in the inhibition of atherogenic fatty streaks. These effects, coupled with other actions of AGE, increase its potential to lower the risk of cardiovascular and cerebrovascular diseases. Other protective actions of AGE include inhibition of platelet aggregation and suppression of prostanoid synthesis with subsequent anti-inflammatory, antiathrogenic and antithrombotic effects. AGE inhibits both, early and late stages of carcinogenesis, resulting in inhibition of tumor growth in many tissues, including colon, mammary glands, skin, stomach and esophagus.[12]

**TURMERIC**

**Synonyms**- Haldi, curcuma, halad, ameshta, manjal

**Biological Source**- Preparations of the plant *Curcuma longa* Linn (Family Zingiberaceae) have been used to treat various ailments for centuries in Ayurvedic medicine. Turmeric is derived from rhizome or root of the plant.

**Geographical Source**- This plant is a perennial herb, indigenous to South and Southeast Asia, where it is grown for commercial use. Though, it is principally cultivated in India, Southeast Asia, China, and other tropical countries, turmeric is also found in other parts of the world.

**Chemical Constituents**- Curcumin (diferuloylmethane), a polyphenol, is an active principle of turmeric. The yellow-pigmented fraction of turmeric contains curcuminoids, which are chemically related to its principal ingredient, curcumin. The major curcuminoids present in turmeric are demethoxycurcumin (curcumin II), bisdemethoxycurcumin (curcumin III), and the recently identified cyclocurcumin. The curcuminoid complex is also referred to as Indian saffron, yellow ginger, yellow root, kacha haldi, ukon, or natural yellow 3. Curcumin was first isolated in 1815, obtained in crystalline form in 1870, and

ultimately identified as 1,6-heptadiene- 3,5-dione-1,7-bis(4-hydroxy-3-methoxyphenyl)-(1E,6E) or diferuloylmethane.[14]

**Anti-ageing Effects-** Traditionally, turmeric has been put to use as a foodstuff, cosmetic, and medicine. In folk medicine, turmeric and natural curcuminoids have been applied as therapeutic preparations over the centuries in different parts of the world. In Ayurvedic medicine, curcumin is a well-documented treatment for various respiratory conditions (e.g., asthma and bronchial hyperactivity) as well as for liver disorders, anorexia, rheumatism, diabetic wounds, running nose, cough, and sinusitis. In traditional Chinese medicine, it is used to treat diseases associated with abdominal pain. In ancient Hindu medicine, it was used to treat sprains and swellings. Other effects include antioxidant, anti-carcinogenic, antimicrobial, hepato-protective, thrombo-suppressive, cardio-protective, hypoglycemic and anti-arthritic.[15] Curcumin is a highly pleiotropic molecule that interacts with numerous targets viz. transcription factors, growth factors and their receptors, cytokines, enzymes, and genes regulating cell proliferation and apoptosis. The anticancer activity of curcumin is due to its capability to induce antioxidant and phase II metabolizing enzymes involved in detoxification. Furthermore, curcumin has anti-angiogenic activity and it can induce cell death. It exhibits chemopreventive effects against various cancers like leukemia, melanoma, breast cancer, lung cancer, prostate cancer, colon cancer, renal cancer, hepatocellular and ovarian carcinomas. Daily administration of curcumin for 7 days led to a significant decrease in serum lipid peroxides, increase in serum HDL cholesterol and a decrease in total serum cholesterol. These findings suggest a potential chemopreventive role for curcumin in arterial diseases. The most compelling and key rationale for the continuing traditional therapeutic use of curcumin is its extremely good safety profile. To date, no studies in either animals or humans have discovered any toxicity associated with the use of curcumin, and it is clear that curcumin is not toxic even at very high doses.[15]

**ASHWAGANDHA**

**Synonyms**- *Withania somnifera* (WS) is popularly known as Ashwagandha or Winter Cherry. The plant is popularly known in India by different vernacular names like Punir (Hindi), Ashvaganda (Bengal, Bombay), Aksan (Punjab), Amukkira (Tamil), Tilli (Marathi). The practitioners of the traditional system of medicine in India regard *W. somnifera* as the "Indian Ginseng".[16]

**Biological Source**- Ashwagandha is derived from the dried roots and stem bases of the plant *Withania somnifera* belonging to the family Solanaceae.

**Geographical Source**- It is an evergreen tomentose shrub, grown wild and found throughout the dry regions of India, Baluchistan, Pakistan, Afghanistan, Sri Lanka, Congo, South Africa, Egypt, Morocco and Jordan. In India, it is widely grown in the provinces of Madhya Pradesh, Uttar Pradesh, plains of Punjab and northwestern parts of India like Gujarat and Rajasthan.

**Chemical Constituents**-The major biochemical constituents of *W. somnifera* are steroidal alkaloids and lactones, a class of constituents together known as withanolides (steroidal lactones with ergostane skeleton). The withanolides have the structural resemblance with the active constituents present in the plant *Panax ginseng* known as ginsenosides. The withanolides have C28 steroidal nucleus with C9 side chain, having six membered lactone ring. Therefore, *W. somnifera* is named as an "Indian Ginseng". So far 12 alkaloids, 35 withanoloids and several sitoindosides have been isolated and their structures have been elucidated. Various alkaloids present in ashwagandha include withanine, somniferine, somnine, somniferinine, withananine, psuedo-withanine, tropine, psuedotropine, 3-α-gloyloxytropane, choline, cuscohygrine, isopelletierine, anaferine and anahydrine. Two acyl steryl glucoside viz. sitoindoside VII and sitoindoside VIII, two glycowithanoloids viz. sitoindoside IX or sitoindoside X have been isolated from the roots of WS.[17]

**Anti-ageing Effects-** Various parts of this plant have been used for centuries to treat a variety of ailments *viz*. bronchitis, asthma, ulcers, emaciation, insomnia, and senile dementia. Many pharmacological studies have been carried out to describe multiple medicinal properties of *W. somnifera*. The plant is reported to have antitumor, radiosensitizer, antistressor, immunomodulatory, anti-inflammatory, aphrodisiac, hepatotonic and antibacterial effects. Clinical trials and animal studies support the use of ashwaganda for anxiety, cognitive and neurological disorders, inflammation, and Parkinson's disease. Ashwaganda's chemopreventive properties make it a potentially useful adjunct for patients undergoing radiation and

chemotherapy. Ashwaganda is also used therapeutically as an adaptogen for patients with nervous exhaustion, insomnia, and debility due to stress. *W somnifera* preparations have been found to have a therapeutic role in almost every CNS related disorder like depression excitotoxicity, Parkinson's disease, Alzheimer's disease, memory loss, cerebrovascular changes, tardive dyskinesia, cerebral ischemia and drug addiction. *W somnifera* modulates GABAergic, cholinergic and oxidative systems. The phytochemicals present in *W somnifera* are responsible for overcoming the excitotoxicity and oxidative damage. The acetylcholinestrase and butyrylcholinestrase activity is inhibited by the withanolides. Few studies indicate that the plant extract may increase the GABA levels in the brain or the extract may act directly at the GABA receptors.[17]

**TOMATO**

**Synonyms**- *Lycopersicon esculentum*, *Lycopersicon lycopersicum,* wolf-apple

**Biological Source**- Tomato is derived from the fruits of the plant *Solanum lycopersicum* belonging to family Solanaceae.

**Geographical Source**- Tomatoes are native to Mexico. It is a popular, versatile and easily grown plant. It is widely cultivated and used throughout the world.

**Chemical constituents**- Tomatoes are rich in carotenoids, especially lycopene. Lycopene is a natural pigment synthesized by plants and microorganisms but not by animals. This product is a long chain polyunsaturated aliphatic compound, an acyclic isomer of β-carotene. In the tomato itself, lycopene is attached to membranes and is not released very easily. During the cooking of tomatoes, this bond of lycopene to membranes is weakened, and for that reason cooked tomatoes make available larger amounts of lycopene than fresh tomatoes. A number of other carotenoids, such as phytoene, phytofluene, β-carotene, γ-carotene, ζ-carotene, and neurosporene are also present in tomatoes. Other commonly consumed fruits that contain lycopene are pink grapefruit, papaya, apricots, watermelons, carrots and pink guavas. Processed tomato products, such as juice, ketchup, paste, sauce and soup are all good dietary sources of lycopene. The average daily dietary intake of lycopene was estimated to be 25 mg/d with processed tomato products, accounting for 50% of the total daily intake.[18]

**Anti-ageing Effects-** Lycopene is the most predominant carotenoid in human plasma. It is one of the most potent antioxidant, with a singlet-oxygen quenching ability twice as high as that of β-carotene and 10 times than that of α-tocopherol. It has been hypothesized to prevent carcinogenesis and atherogenesis by protecting critical cellular biomolecules, including lipids, lipoproteins, proteins and DNA. Lower blood lycopene levels can also be associated with increased risk of coronary artery disease and death. Lycopene has been shown to act as a hypocholesterolemic agent by inhibiting HMG–CoA (3-hydroxy-3-methylglutaryl– coenzyme A) reductase. Consuming tomatoes reduced the risk of cardiovascular disease and neurological disorders.[19] High intake of tomatoes can be linked to the protective effects against all types of cancers including digestive tract cancers, breast cancer and prostate cancer. Dietary antioxidants, including lycopene, may potentially reduce the impact of oxidative load from *H. pylori* infections in the stomach.[20]

**ANWALA**

**Synonyms**- Emblica, Indian goose berry, Amalaki, Amla.

**Biological Source-** Anwala is derived from dried, as well as fresh fruits of the plant *Emblica officinalis* Gaerth (*Phyllanthus emblica* Linn.), belonging to the family Euphorbiacae.

**Geographical Source**- It is a small or medium size tree found in all deciduous forests of India. It is also found in Sri Lanka, Bruna, Malaya, China, Pakistan and Bangladesh.

**Chemical Constituents-** Amla fruit is a rich natural source of vitamin C and contains 600 to 750 mg per hundered g of fresh pulp. Apart from that Anwala also contains about 0.5% fat, phyllemblin and 5% tannin. Amla fruits are also rich in minerals like phosphorus, iron and calcium. It contains appreciable amount of pectin. Fresh juice or solvent extract of Emblica fruits contain emblicanin A, emblicanin B, punigluconin and pedunculagin.

**Anti-ageing Effects-** According to the two main classic texts on Ayurveda, Charak Samhita and Sushruta Samhita, Anwala is regarded as the best among rejuvenative herbs, useful in relieving cough and skin diseases. The fruit pulp is being used in several indigenous medical preparations against a variety of conditions such as headache, dizziness, liver injury, atherosclerosis and diabetes. In Unani medicine, it is

described as a tonic for heart and brain. In traditional medicine, it is also used for various conditions like glucose intolerance, cerebral insufficiency and mental disorders. It is a major ingredient in several important medicinal preparations including Triphala and the famous Chyawanprash, a general tonic for people of all ages, which improves mental and physical well-being.[21] Amla has been shown to possess antioxidant, adaptogenic, hepatoprotective, anti-tumour, anti-inflammatory, hypocholesterolemic, immunomodulatory, cytoprotective, cardioprotective and memory enhancing activity.[22] Oxygen free radicals are implicated in the age-related disorders. Anti-ageing action of amla is mainly due to scavenging of free radicals.[23]

**GINGER**

**Synonyms**- Adrak, gingerin, saunth

**Biological Source**- Ginger is derived from the rhizomes of *Zingiber officinalis* Roscoe, belonging to the family Zingiberaceae.

**Geographical Source**- It is a reed like plant, grown in many parts of the world, including Jamaica, China, India and Africa. Ginger has been cultivated in India from the ancient times. This spice was used by the Greeks and Romans, and was a common article of European commerce in the middle ages. It was well known in England in the eleventh century.

**Chemical Constituents**- Ginger contains volatile oils, which comprise of over 50 components. These oils include zingiberene, b-sesquiphellandrene, b-bisabolene, citral, cineole, geraniol, curcumene and zingiberol. The pungency of fresh ginger is due to gingeols and shogaols. It contains several hundreds of valuable compounds and new constituents.

**Anti-ageing Effects**- The main pharmacological actions of ginger include immuno-modulatory, anti-tumor, anti-inflammatory, anti-apoptotic, anti-hyperglycemic, hypolipidemic, antiemetic, anti-platelet and hypotensive actions. Ginger is a strong antioxidant and prevents generation of free radicals. Ginger shows anti-inflammatory action by inhibiting production of nitric oxide, inflammatory cytokines and enzyme prostaglandin synthase and arachidonate-5-lipoxygenase. Ginger extract significantly reduced the development of atherosclerotic plaques, lowered LDL-cholesterol levels and raised the HDL-cholesterol levels. Ginger is found to be useful in alleviating pain associated with osteoarthritis of knee[24] and improving memory in rodents.[25]

**ALOE VERA**

**Synonyms-** Aloe, musabbar, kumari

**Biological Source**- *Aloe vera* (*Aloe barbadensis* Miller) is a perennial succulent belonging to the Liliaceae family.

**Geographical Source**- It is a cactus like plant that grows in hot and dry climates. Curacao, Barbados, Aruba and Bonaire (West Indian islands), South Africa, Socotra and Zanzibar islands. It is also cultivated in Europe and North West Himalayan regions in India.

**Chemical constituents-** The components of *Aloe vera* are primanrily glycoproteins, anthraquinones, saccharides, and low-molecular-weight substances. Anthraquinones are aloin, aloe-emodin, babaloin, isobarbaaloin and others. Low-molecular substances include alosin, b-sitosterol, diethylhexylphthalate, vitamins, and beta-carotene. Polysaccharides include acetylated mannan (acemannan), glucomannan, acetylated glucomannnan and galactoglucoarabinomannan.[26]

**Anti-ageing Effects-** Aloe grows in a hot and dry climate. Perhaps, its survival in a harsh environment encourages people to believe that it has wound-healing and antibiotic effects. The whole gel extract of *Aloe vera* has been reported to have various pharmacological properties such as anti-inflammatory, antifungal, hypoglycemic, wound, burn and frostbite healing, gastroprotective and anticarcinogenic activities. Anti-inflammatory and wound healing activities of aloe are due to the presence of anthraquinones and glycoproteins. Anthraquinoes may act as antioxidants and radical scavengers. Glycoproteins stimulate the cell proliferation and promote the growth of normal human cells like human fibroblasts. The antioxidant action of anthraquinones is indicated by protection against hepatocyte death and inflammatory response that occurs subsequent to lipid peroxidation. Polysaccharides, especially acemannan was found to have immunomodualtory activity by activating macrophages, enhancing cytokine release, stimulating interactions between macrophages, T-lymphocytes and B-lymphocytes. Polysaccharide rich Aloe inhibits carcinogenesis by chemopreventive activity and by inhibition of

carcinogen activation or by the induction of detoxifying enzymes. *Aloe vera* can be effective in the treatment of non insulin dependent diabetes mellitus.[27]

**TULSI**

**Synonyms-** Sacred basil, holy basil, tulasi

**Biological Source-** Tulsi consists of fresh and dried leaves of *Ocimum sanctum*, Family: Labiatae.

**Geographical Source-** It is a herbaceous, multi branched annual plant found throughout India. It is considered as a sacred plant by Hindus. The plant is commonly cultivated in gardens and also grown near temples. Tulsi, now a days is cultivated commercially for its volatile oils.

**Chemical Constituents-** Tulsi leaves contain bright, yellow coloured and pleasant volatile oil, alkaloids, glycosides, saponin tannins, flavonoids and appreciable amount of vitamin C, citric acid and tartaric acid. The oil contains approximately 70%eugenol, 3% carvacrol, eugenol-methyl-ether (20%). It also contains caryophyllin.

**Anti-ageing Effects-** Different parts of this plant are traditionally used in Ayurveda and Sidha systems for treatment of diverse ailments. *O. sanctum* leaves have anti-inflammatory, analgesic and immuno-stimulatory activity. Flavonoids isolated from *O. sanctum* possess free radical scavenging activity and show anti-lipoperoxidant effect. Free radical scavenging activity of flavonoids provides for healing of wounds and also protects cellular damage. Free-radical scavenging activity results in decreased oxidative stress and thereby protects various age related cellular-damages.[28] Tulsi is found to be useful memory enhancer.[29]

## CONCLUSION

Leading a disease free, long life (longevity) has been a dream of mankind since the arrival of human race on the planet Earth. Although, death is the most certain event known to man, he has been striving hard to delay this dreadful event with help of medicines. With the advances in therapeutics and surgical procedures, partial success has been accomplished in enhancing the life-span of human beings. Ageing is a continuous, universal, progressive, intrinsic and deleterious process, which decreases an organism's ability to maintain homeostasis in the face of environmental stressors. Thus, the ageing process enhances the likelihood of dying. Sagging skin, wrinkled face, graying hair, loss of muscle strength, reduced reflexes and low energy levels faulty memory, weak immunity, impaired hearing, decreased libido, cardiovascular problems and neurodegenerative disorders are the characteristic features of ageing. As a matter of fact, traditional systems of medicine (such as Ayurveda, Sidha, Unani and Homeopathy), relies on herbal medicines. An intelligent supplementation of daily diet with anti-ageing nutrients coupled with regular exercise and disciplined life would all go a long way in fulfilling the long cherished dream of longevity.

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