



REVIEW ARTICLE

GLOBALIZATION OF RASAYANA AS ANTI-OXIDANTS FOR THE MANAGEMENT OF AGEING

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ABSTRACT

Ageing is not a disease; it is the progressive decline in physical, physiological and psychological function of the body over time. In recent time, due to increased life expectancy and increased medical knowledge, demand of anti-ageing medicine is increasing day by day. There is a growing market for anti-ageing products from non-invasive procedures to facelifts. The landscape of anti-ageing is changing rapidly and people are continuously looking for anti-ageing therapy which are convenient and without side effects. **Objectives:** This study is focused at reviewing the *Ayurvedic* and modern literature related to ageing and its prevention with *Ayurveda*. **Materials and Methods:** Various *Ayurvedic* and modern texts books, research papers, journals and websites have been referred for this purpose. **Conclusion:** *Ayurveda* is the traditional system of medicine of India and contains a very scientific description of age and age related changes. *Ayurveda* has a great potential in the field of anti-ageing as there are lots of single herbs and preparations which possess anti-oxidant properties and slow down the process of ageing and thus increase the longevity of the individuals.

Keywords: Ageing, Anti-oxidants, *Rasayan*, *Ayurveda*.

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INTRODUCTION

Ageing is not a disease; it is the progressive and universal decline first in functional reserve and then in function that occurs in organism over time; however the risk of developing disease is increased. The biochemical composition of tissues changes with age; physiologic capacity decreases, the ability to maintain homeostasis declines and vulnerability to disease processes increases with age^[1].

According to population census 2011 there are nearly 104 million elderly persons (aged 60 years or above) in India; 53 million females and 51 million males^[2]. Population ageing is a global phenomenon. The elder persons in the society face a number of problems due to absence of assured and sufficient income to support themselves for their healthcare and other social securities. The trend clearly reveals that ageing will emerge as major social challenge in the future; and vast resources will be required towards the support, service, care and treatment of the elderly persons.

Ayurveda, being the science of life has got the potential for prevention of diseases by restoration of health and management of diseases occurring in old age by promoting immunity. *Rasayana*^[3], a branch of *Ayurveda* deals with the age related health problems. There are so many single drugs

described in *Rasayan* chapter which act as anti-oxidant and ensure good health during increasing age.

MATERIALS AND METHODOLOGY

This article is based on a review of *Ayurvedic* and modern texts along with research related to ageing, *Rasayana*, anti-oxidants and other relevant topics. The main *Ayurvedic* texts used in this study are *Charaka Samhita*, *Sushruta Samhita*, *Astanga Samgraha*, *Astanga Hridaya*, *Sharangdhara Samhita* and their commentaries. Various research papers, journals and websites have also been referred.

Growth, Development and Ageing

Ageing has been a fact of life ever since it was created. Human beings go through various phases of life from being child to youth being the best part of the life from health point of view. Good health, strong muscles, an efficient immune system, a sharp memory and a healthy brain are joy of youth. Then come the old age in which body's own intrinsic and genetic powers to defend decreases progressively, body becomes unable to maintain and repair itself in order to work efficiently. Ageing has been believed to be inherent, universal progressive natural phenomena. Still, it is considered as most unexpected and undesirable thing because of its detrimental effects.

In *Ayurveda*, old age has been termed as *Vridhha* or *Jeerna* (old) which is 60-100 years of age. During this stage, degeneration of body tissues (*dhatu*s) starts. Their functions also begin to hamper. The strength of sense organs starts to diminish with decrease in sexual desire. Power of understanding, retention, memory and speech also decreases^[4]. *Acharya Sushruta* has considered the old age after 70 years of age until death. According to him, in old age there are progressive degenerative changes in body tissues and sensory functions. There is progressive loss of strength and enthusiasm. Person suffers from many chronic diseases and unable to perform the normal routine work^[5].

Acharya Sharangdhara has described the age in very different and interesting manner. He has divided the age into decades and has mentioned loss of a biological feature in every decade of life. This is as follows^[6]:

- First decade of life - *Balya* (Childhood)
- Second decade of life - *Vridhhi* (Growth)
- Third decade of life - *Chhavi* (Beauty)
- Fourth decade of life - *Medha* (Intellect)
- Fifth decade of life - *Tvaka* (Health of skin)
- Sixth decade of life - *Drishti* (Vision)
- Seventh decade of life - *Shukra* (Sex)

- Eighth decade of life - *Vikrama* (Strength)
- Ninth decade of life - *Buddhi* (Wisdom/ Psychological function)
- Tenth decade of life - *Karmendriya* (Sensory Function loss)

If analysed then this division seems to be very logical as after 1st decade of life, childhood gets over. After 2nd decade of life, body's growth stops. In 3rd decade of life, signs of ageing though very fine but start to occur. In 4th decade of life, intellectual power hampers due to worries and stress. In 5th decade of life, signs of ageing become visible on skin. In 6th decade of life, eyesight gets weak. In following decades all these sexual, mental and physical strength vanish and lastly death occurs.

Effects of Ageing

The phenomenon of population ageing is becoming a major concern all over the world, both for developed and developing countries. Our country too is not immune to this demographic change. The proportion of older persons in the population has increased. Due to economic well-being, better health care system, good medicines, etc. there is substantial reduction in mortality in the society. These factors together have resulted in increasing number of elderly persons in the population. Old age comes with lot of ailment and diseases. Although all organs start

showing deterioration with ageing, following organs show evident morphologic and functional changes^[7]:

- Cardiovascular system: Atherosclerosis, arteriosclerosis with calcification, brown atrophy of heart, loss of elastic tissue from aorta and major arterial trunks causing their dilatation.
- Nervous system: Atrophy of gyri and sulci, Alzheimer's disease, Parkinson's disease.
- Musculoskeletal systems: Degenerative bone diseases, frequent fractures due to loss of bone density, age related muscular degeneration.
- Eyes: Deterioration of vision due to cataract and vascular changes in retina.
- Hearing: Disability in hearing due to senility is related to otosclerosis.
- Immune system: Reduced IgG response to antigens, frequent and severe infections.
- Skin: Laxity of skin due to loss of elastic tissue.
- Cancers: 80% of cancers occur in the age range of 50-80 years.

But as the medical knowledge is increasing at an amazing rate so the view of age related health and well-being has been changed. People want to live young and healthy.

Scope of Anti-ageing in Modern Science

With age, structural and function changes occur in different organs and systems of human body. There is no established biologic basis of ageing but some theories have been proposed to explain the basis of ageing. These are:

- Experimental cellular senescence
- Genetic control
- Oxidative stress hypothesis (free radical mediated injury)
- The wear and Tear theory

Among these oxidation, glycation and methylation has been considered important as the role of antioxidant in retarding the oxidant damage has been reported in some studies.

So, the anti-ageing treatment has been based on use of anti-oxidants and balancing of hormones mainly. Diet, exercise, nutraceutical supplements (anti-oxidants, vitamins and minerals) and hormones are used for this purpose. Future of anti-ageing in modern medicine will involve manipulating genes, increasing utilization of stem cells and targeted delivery of nutrients and drugs using nanotechnology.

Rasayana- Rejuvenation Therapy

Rasayana Tantra is one of the eight major clinical disciplines of *Astanga Ayurveda*^[8]. The term does not only refer to a drug or a therapy but it is a comprehensive approach for the healthy body, mind and the spirit for total well-being of an individual.

Rasayana therapy is the rejuvenation therapy to revitalize and rejuvenate the whole functional dynamics of the body system.

According to *Acharya Charaka*, *Rasayana* increases immunity in a healthy person and rejuvenate the body at cellular and molecular level is *Rasayana*^[9].

According to *Acharya Sharangdhara*, whatever which cures diseases and prevents ageing is *Rasayana*^[10].

Similarly antioxidants are being recommended in all types of diseases and even for general health nowadays. Antioxidants are being used as the diet supplement to prevent the process of ageing and old age diseases.

Classification of *Rasayana*

Acharya Charaka has described 2 types of *Rasayana* based on their mode of administration^[11]:

- i. *Vatatapika* / *Sourya-Marutika*
(Outdoor administration)
- ii. *Kuti Pravesika* (Indoor administration)

Acharya Dalhana (commentator of *Sushruta*) has mentioned 3 types of *Rasayan* based on the purpose^[12].

- i. *Kamyā Rasayana* (Promote physical and mental health for longevity)
- ii. *Naimittika Rasayan* (Disease specific regimen)
- iii. *Ajasrika Rasayana* (Dietary regimen)

***Rasayana* drugs**

Acharya Charaka has mentioned *Amrita*, *Abhya*, *Dhatri*, *Mukta*, *Aprajita*, *Jeewanti*, *Shatavari*, *Mandukaparni*, *Sthira* and *Punarnava* as *Vaya-sthapana* (anti-ageing) drugs. These drugs are mentioned to slow the process of ageing and to protect the body from age related diseases^[13].

Acharya Charaka and *Sushruta* has mentioned numerous single herbs and compound preparation which are used as *Rasayana*. Some of these are:

- ***Haritaki (T. chebula)***: *T. chebula* exhibited anti-lipid peroxidation, antiperoxide radical formation and free radical scavenging activities. In vitro evaluation of *T. chebula* shows that tri-ethyl chebulate is a strong antioxidant and free-radical scavenger, which might contribute to the antioxidative ability^[14].
- ***Amalaki (E. officinale)***: It is the richest source of vit. C and possess antioxidant, hepatoprotective, hypocholesterolemic and anti-inflammatory activities^[15].
- ***Bhallataka (Semecarpus anacardium)***: *Bhallataka* increases the level of non-enzymatic antioxidants (GSH, Vitamin E, Vitamin C) and enzymatic antioxidants to near normal levels in arthritic rats, elevated antioxidant levels and cytochrome P450 contents

- in hepatocellular carcinoma, and protected against lipid peroxidation^[16].
- **Brahmi (*Bacopa monnieri*):** Its extract induced a dose-dependent free radical scavenging capacity, protective effect on DNA damage in human non-immortalized fibroblasts^[17].
 - **Yashtimadhu (*Glycyrrhiza glabra*):** Its roots possess several antioxidant constituents namely hispaglabridin A, hispaglabridin B, glabridin, 4'-O-methylglabridin, isoprenylchalcone derivative, isoliquiritigenin, and formononetin^[18].
 - **Guduchi (*Tinospora cordifolia*):** Its extracts exerted strong antioxidant effects, demonstrated free radical scavenging activity particularly against superoxide and hydroxyl radicals^[19].
 - **Triphala:** (*Triphala* is a polyherbal *Rasayana* which consists of dried fruits of *Terminalia chebula*, *Terminalia bellirica* and *Emblica officinalis* in equal parts.) Apart from wide array of biological activities and therapeutic credentials, *Triphala* and its constituents are highly acknowledged for their significant antioxidant or anti-ageing potential^[20].
 - **Shalparni (*Desmodium gangeticum*):** Its extract also showed scavenging abilities and activity^[21].
 - **Bakuchi (*Psoralea corylifolia*):** Its seeds contain the bakuchiol, bavachinin, bavachin, and isobavachin and isobavachalcone and they showed broad antioxidative activities^[22].
 - **Kutki (*Picrorrhiza kurroa*):** Roots of *Kutki* contains picroliv, picroside-I and kutkoside which scavenge the superoxide anions and possess the antioxidants properties^[23].
 - **Tulsi (*Ocimum sanctum*):** *Tulsi* has been reported to show its antioxidant activity by attenuation of stress-induced changes in antioxidant enzymes like superoxide dismutase, catalase and glutathione peroxidase and endogenous antioxidants such as reduced glutathione^[24].
 - **Vacha (*Acorus calamus*):** *Vacha* was found to be potent antioxidant by inhibition of DPPH free radical^[25].
 - **Kokilaaksha (*Hygrophila auriculata*):** *Kokilaaksha* showed significant radical scavenging activity against DPPH with moderate scavenging activity against nitric oxide, hydroxyl radical, ferryl bipyridyl complex and LPO^[26].
 - **Kapikacchu (*Mucuna pruriens*):** *Kapikacchu* demonstrated anti-lipid peroxidation property, mediated through the removal of superoxides and hydroxyl radicals^[27].

➤ **Ardraka (*Zingiber officinale*):** The active principles of *Ardraka* zingerone, 6gingerol, 8-gingerol, 10-gingerol, and 6 shogaol demonstrated significant free radical scavenging activity particularly against DPPH radical, superoxide radical and hydroxyl radical in in-vitro assays [28].

Other Indian medicinal plants having antioxidant properties are: (with common/ *Ayurvedic* names in brackets) *Aegle marmelos* (Bengal quince, *Bel*), *Allium cepa* (Onion), *Allium sativum* (Garlic, *Lahsuna*), *Aloe vera* (Indian aloe, *Ghritkumari*), *Amomum subulatum* (Greater cardamom, *Barielachi*), *Andrographis paniculata* (The creat, *Kiryat*), *Azadirachtaindica* (*Neem/Nimba*), *Camellia sinensis* (Green tea), *Cinnamomum verum* (Cinnamon), *Cinnamomum tamala* (*Tejapatra*), *Curcuma longa* (Turmeric, *Haridra*), *Hemidesmus indicus* (Indian Sarasparilla, *Anantamul*), *Momordica charantia* (Bitter gourd), *Nigella sativa* (Black cumin), *Picrorrhiza kurroa* (*Katuka*), *Plumbago zeylanica* (*Chitraka*), *Syzigium cumini* (*Jamun*), *Terminalia bellarica* (*Baheda*) and *Trigonella foenum graecum* (Fenugreek). There are also a number of *Ayurvedic* formulations containing ingredients from medicinal plants that show antioxidant activities [29].

Ayurvedic formulations having antioxidant properties:

- *Prathama Bhramarasayana*^[30]
- *Dwitiya Bhramarasayana*^[31]
- *Chyavanaprasha*^[32]
- *Amalaka Rasayana*^[33]
- *Haritakyadi Rasayana*^[34]
- *Haritakyadi Yoga*^[35]
- *Amalaka Ghrita*^[36]
- *Amalakavleha*^[37]
- *Amalaka Churna*^[38]
- *Vidangavleha*^[39]
- *Naagbala Rasayana*^[40]
- *Bhallataka Kshira*^[41]
- *Bhallataka Kshaudra*^[42]
- *Bhallataka Taila*^[43]
- *Amalakayasa Bhramarasayana*^[44]
- *Lohadi Rasayana*^[45]
- *Endra Rasayana*^[46]
- *Pippali Rasayana*^[47]
- *Pippali Vardhamana Rasayana*^[48]
- *Triphala Rasayana*^[49]
- *Indraokta Rasayana*^[50]
- *Bhramighrita Rasayana*^[51]
- *Vacha Rasayana Yoga*^[52]

Disease Specific/Naimittika Rasayana

Disease-specific *Rasayana* therapy has been mentioned by *Acharya Sushruta* and his commentator *Dalhana* as *Naimittika Rasayana*. *Acharya Sushruta* mentioned *Shilajatu* and *Tuvaraka Rasayana* for *Prameha* (Diabetes) and *Kushta* (Leprosy) respectively.

Selection of Rasayan

According to age:

Age in years	Affected biological factor	Rasayana to be used
0-10	<i>Balya</i>	<i>Vacha, Kashmari, Swarana</i>
11-20	<i>Vridhhi</i>	<i>Kashmari, Ashwagandha, Bala</i>
21-30	<i>Chhavi</i>	<i>Loha, Amalaki</i>
31-40	<i>Medha</i>	<i>Sankhpushpi, Brahmi, Jyotishmati</i>
41-50	<i>Tvaka</i>	<i>Jyotishmati, Priyala, Somraji, Bhringraja</i>
51-60	<i>Drishti</i>	<i>Jyotishmati, Triphala, Loha, Shatavari, Amalaki</i>
61-70	<i>Shukra</i>	<i>Atmagupta, Vajikara</i>
71-80	<i>Vikrama</i>	<i>Rasayana are not much effective</i>
81-90	<i>Buddhi</i>	<i>Rasayana are not much effective</i>
91-100	<i>Karmendriya</i>	<i>Rasayana are not much effective^[53]</i>

Rasayana according to Deha prakriti

Deha Prakriti	Rasayana to be used
<i>Vata Pradhan</i>	<i>Bala, Amalaki with ghrita</i>
<i>Pitta Pradhan</i>	<i>Amalaki, Shatavari</i>
<i>Kapha Pradhan</i>	<i>Bhallataka, Rasna, Guggulu, Pippali^[53]</i>

According to the season (Kala)

Kala(Season)	Rasayana to be used
<i>Aadana Kala</i>	<i>Sheet virya, laghu guna yukta</i>
<i>Visarga Kala</i>	<i>Ushna virya^[53]</i>

Ritu	Rasayana to be used
<i>Hemanta(Dec-Jan)</i>	<i>Dugdha, ghrita, Madhuyashti, Bala, Bhallataka, Atibala, Paradaetc.</i>
<i>Shishira (Feb-Mar)</i>	<i>Dugdha, ghrita, Madhuyashti, Bala, Bhallataka, Naagbala, Atibala, Parada, Gambhari etc.</i>
<i>Vasanta (Apr-May)</i>	<i>Brihati, Pada, Bhringraja, Tulsi, Chandana, Haritaki,</i>

	<i>Sankhpushpi, Pippali, Shilajatu etc.</i>
<i>Grishma (Jun-July)</i>	<i>Vidarikanda, Swarna, Gokshur, Madhuyashti, Bala, Atibala, Dugdha, Ghrita etc.</i>
<i>Varsha (Aug-Sept)</i>	<i>Bhallataka, Madhu, Pippali, Chitraka, Chavya, Haritaki, Paradaetc.</i>
<i>Sharada (Oct-Nov)</i>	<i>Mandukaparni, Vidarikanda, Amalaki, Ushira, Naagbala, Ghrita, Swarana etc.</i> ^[54]

According to place (*Desha*)

<i>Desha</i>	<i>Rasayana to be used</i>
<i>Sadharana</i>	<i>Sadharana dravya</i>
<i>Jangala</i>	<i>Snigdha, Ushna dravya</i>
<i>Anoopa</i>	<i>Ruksha dravya</i> ^[55]

According to metabolism (*Agni*)

<i>Agni</i>	<i>Rasayana to be used</i>
<i>Jatharagni</i>	<i>Vidanga, Chitraka, Pippali Haritaki</i>
<i>Dhatwagni</i>	<i>Amalaki, Amrita, Kumari, Pippali</i> ^[55]

According to body elements (*Dhatu*)

<i>Dhatu</i>	<i>Rasayana to be used</i>
<i>Rasa</i>	<i>Kharjura, Draksha, Kashmari</i>
<i>Rakta</i>	<i>Loha, Amalaki, Palandu, Bhringraja</i>
<i>Mamsa</i>	<i>Bala, Naagbala, Rudanti, Ashwagandha, Shalparni</i>
<i>Meda</i>	<i>Guggulu, Shilajatu, Amrita, Haritaki</i>
<i>Asthi</i>	<i>Laksha, Vanshlochan</i>
<i>Majja</i>	<i>Loha, Vasa</i>
<i>Shukra</i>	<i>Atmagupta, Vajikara dravya</i> ^[55]

Biological effect of *Rasayana*

Rasayana has multi- dimensional effect

a) **Anabolic effects-** Regular administration of herbs like *Gambhari* (*Gmelina arborea*) was found to

improve nitrogen balance and promote tissue building.

- b) **Anti-stress, adaptogenic effects-** Pharmacological investigations on drugs like *Ashwagandha* and *Shilajatu* point to this unique biological effect of *Rasayana* drugs. A *Rasayana* drug can neutralize the negative effects of stress on physiology and restore homeostasis. This effect is termed as anti-stress effect. A long term administration of such drugs may enhance one's own tolerance levels and helps to cope with stress better. This is termed as adaptogenic effect.
- c) **Immunomodulatory effect-** Available evidences show that, *rasayana* drugs can be used to modulate the immune functions. They may work to enhance the immune function and build you firm deep within, or they might pacify an angry immunity cell to be in limits on the other.
- d) **Nootropic effects** - This refers to a specified group of drugs which work upon the intellect, the "*Medha*". Some of the herbs have effects mainly on memory and learning abilities like *Brahmi* (*Bacopa monieri*), *Shankapuspi* (*Convolvulus pluricaulis*) etc.
- e) **Anti-oxidant effect-** *Rasayana* drugs are now discovered to help the

physiology in overcoming oxidative injury. *Rasayana* drug enhances the natural enzymatic defence mechanism of the body.

- f) **Anti-ageing effects-** Neurotransmitters such as norepinephrine or dopamine (DHEA) are released in stress conditions. Repeated stress on every cell causes ageing process. *Rasayana* drugs could influence the secretion of hormone DHEA the deficiency of which is implicated in ageing^[56]

Acharya Rasayana¹

Acharya Charaka has mentioned some social and personal conducts by which one can acquire the *Rasayana* effect. These are:

- Always speak the truth
- Do not take alcohol
- Remain calm in every condition
- Abstained from sex and violence
- Consume milk, ghee daily
- Develop intellectual mind^[57]

Acharya Rasayana can be considered as a non-pharmacological approach to prevent aging by decreasing oxidative stress.

CONCLUSION:

Ageing is an inevitable part of life and it can't be avoided by any mean but healthy and slow ageing can be achieved. All the problems of old age occur due to degenerative changes in the body and these degenerative changes are due to oxidative stress mainly. There is a

basic similarity in *Rasayana* drugs of *Ayurveda* and antioxidants of modern medicine, as *Rasayana* helps in rejuvenation of body cells because of anti-oxidant property. So, herbs and preparations described as *Rasayana* should be used as a medicine to manage the free radical mediated diseases. Available data and researches show that these medicines are effective but a lot of extensive study is required to collect the supporting scientific data. Researches should be done to regarding the dose, maximum dose, duration and mode of action. Animal trial should be conducted with different objective and subjective parameters to establish the efficacy of *Ayurvedic* drugs in international market.

ABBREVIATIONS:

CAT: Catalase

DPPH: 1,1-diphenyl-2-picrylhydrazyl

NADPH: Nicotinamide Adenine Dinucleotide

Phosphate

GSH: Glutathione

GSH-px: Glutathione Peroxidase

GSH-R: Glutathione Reductase

GST: Glutathione S-transferase

LDL: Low Density Lipoproteins

LPO: Lipid Peroxidation

MDA: Malondialdehyde

RNS: Reactive nitrogen species

ROS: Reactive oxygen specie

SOD: Superoxide Dismutase

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