

**BIOLOGICAL EFFECTS AND MODE OF ACTION OF RASAYANA DRUGS**

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**ABSTRACT**

Rasayana drugs in *Ayurveda* are used as dietary and therapeutic measures to delay aging and rejuvenate the human body by enhancing the immunity of the human body and by attaining longevity this therapy is known as *Rasayana chikitsa* (rejuvenation therapy). There are many single and compound *Rasayana* drugs possessing potential biological properties like immunomodulatory effect, free-radical scavenging, adaptogenic or anti-stress, and nutritive effects are described in *Ayurveda* literature for their use in health promotion and management of diseases with improvement in the quality of life. Indian medicinal plants with these activities have been reviewed and their antioxidant and immunomodulatory effects are discussed. The present article is an attempt to emphasize the clinical significance of *Rasayana* drugs.

Keywords: *Rasayana*, *Dhatu*, *Ayurveda*, Rejuvenation, Anti-ageing, Antioxidants

INTRODUCTION

Disease (dis-ease) is the disturbance of ease i.e., comfort, freedom from constraint, annoyance, awkwardness, pain, or trouble both bodily and mental. Since time immemorial, man has tried to lead a disease-free life. Vedas are considered to be the oldest repository of human knowledge and *Atharveda* is considered to be a part of *Vedas* which specifically discuss the plants with their medicinal aspects as *oushidhis* (259 medicinal drugs). The description of medicinal drugs and their use is mentioned in *Vedas* but the first-ever division as a specific branch came into existence during *Vagbhata* Era (7th century AD). There was a substantial development in the system of *Ayurveda* during the period of *Charak Samhita* and *Sushrut Samhita*, the treatises on medicine and surgery wrote about 1000 BC to 1000 AD. *Rasayana* tantra is one of the eight branches of *Ayurveda*. *Rasayana* drugs are used as both preventive and curative drugs. *Rasayana* can be a single drug or formulation of medicinal drugs which are immunomodulators and thereby helps in improving immunity and preventing untimely aging and many diseases (1)(2,3). *Charaka Samhita* has dedicated the first chapter for *Rasayana* in *Cikitsasthana* and divided it into four *Padas* (1). *Rasayana* has been given first preference because it not only maintains the healthy state of an individual but also cured ailments, the two faces of *Cikitsa* (1)

दीर्घमायुः स्मृतिमेधामारोग्यं तरुणं वयः /

प्रभावर्णस्वरौदार्यं देहेन्द्रियबलं परं //

वाक्सिद्धिं प्रणतिं कान्तिं लभते ना रसायानात् /

लाभोपायो हि शस्तानाम रसादीनां रसायनम् || (च. चि. १/१/७-८)

Rasayanas help in prolonging life, improving memory, promoting health, provides immunity against diseases thereby helping an individual to lead an energetic and quality life. Complexion and luster of the body gets improved, and tone of voice and speech improves, and better functionality of sensory and motor organs can be ensured by the use of *Rasayanas*

(1). Description of *Rasayanas* in *Charak Saamhita* is mentioned in four separate chapters in *Cikitsasthana* whereas *Shushrut Samhita* is described in only one chapter in *Uttaratantra*. Later combinatory works

like *Bhavaprakasa*, *Sarnghadhara Samhita*, *Yogaratanakara* have also allocated *Rasayana* a separate section which followed *Vagbhata*.

'Rasayana' concept of 'Ayurveda'

The mode action of healing concept of *Rasayana* drugs is of two types, *Svathasyorjaskara* and *Roganuta* or *Rogaghna*(4). *Svathasyorjaskara Rasayana* drugs promote strength and immunity in healthy individuals whereas *Roganuta* or *Rogaghna Rasayana* drugs treatment of various disorders. That *Rasayana* drugs which promote strength and immunity, mostly in healthy individuals, are usually included in *Vrishya* (Aphrodisiac) and the treatment procedure is called *Rasayana* therapy (rejuvenation and promotive treatment). (5) The word *Rasayana* means the way to attaining excellent *Rasadidhatus*. (6) The actions of *Rasayana* drugs help in the development helps in the creation of quality *Dhatus* which further helps in the improvement of nutritional status which further leads to longevity, improved strength, and better immunity. *Oja* is the factor responsible for the *Vyadhikshamatva* (immunity) of an individual. (7)

Ayurvedic concept of the Immune system "Vyadhikshamatva"

Chakrapani highlights the concept of *Vyadhikshamatva* as –

व्याधिक्षमत्वं व्याधिबलविरोधित्वं | व्याध्यूत्याद्प्रतिबन्धकत्वम् इति || (च. सु. २७/७)

The capacity of an individual to prevent the onset of a disease or to decrease the severity of a developed disease is called *Vyadhikshamatva* (8). *Ayurveda* texts state that this is directly influenced by the nature of diet and lifestyle, whether they are wholesome or unwholesome. *Vyadhikshamatva* mostly depends on *Bala* (8). *Bala* is used as a synonym for *Vyadhikshamatva* and has sufficient references available in ancient texts to state that *Bala* is the chief influencer to identify the capacity of a body to resist diseases (8).

त्रिविधं बलमिति – सहजं, कालम, युक्तिकृतं च | सहजं यच्छरीरासत्वयोः प्राकृतं, कालकृतमृतुविभागजं वयः कृतं च, युक्तिकृतं पुनस्तद्यदाहारचेष्टा योग्यम् || (च. सु. ११/३६)

Bala is obtained through three sources – *Sahaja*, *Kalaja*, and *Yuktikrita*. *Rasayana* can play a crucial role in modulating *Bala* and thereby providing *Vyadhikshamata* (9).

Ayurvedic concept of '*Rasayana*' not only lays the principal of a new hypothesis of having an immunomodulatory effect but also goes beyond it by enhancing the entire human immune system with its diverse and complicated immune endocrine pathway. According to *Sushruta* communicable diseases are caused due to the *Agantuka Karana* and come under the *Adhibhautika* or *Sanghatabalapravrutta Vyadhi*, which is an *Aupasargika Roga* (10). *Bhutas* or living creatures or viruses etc are the causative agents and the disease can be transmitted from one person to another person (10). To deal with these creatures comes the concept of *Vyadhikshamatva* which is interpreted as *Vyadhi Balavirodhitva* (antagonistic to strength and virulence of disease) and *Vyadhi Utpadaprativandhatva* (the capacity to inhibit or neutralize or resist or overcome disease-causing agents). The effectiveness of *Vyadhikshamatva* depends on the presence of *Bala* or *Oja* in the body. The *Oja* represents energy and level of resistance to disease. *Ojas* is said to be the *Sara* or essence of the *Dhatu*s (products of the food we consume). *Ojas (Bala)* is responsible for the strength and proper functioning of various vital organs of the body. The loss or deficiency of *Ojas* leads to degeneration and finally weakening of the human body (10).

Diseases are produced due to infections, which show their symptoms before the loss of immunity or *Vyadhikshamatva*. *Rasayana* drugs possess potent antioxidant effects. *Kamya Rasayana*, *Naimittika Rasayana* and *Ajasrika Rasayana Dravyas* helps in creation of proper *Rasadidhatu*s which is ultimately responsible for increase of *Oja* (10). The preventive and community medicine aspect are covered under *Achara Rasayana Sevana*, which can decrease the spread of the disease (10).

DISCUSSION

Biological Effects of Rasayana Drugs

Various recent studies done on different aspects of

Rasayana drugs reported to have immunomodulator, apoptogenic, antioxidant, nootropic, antistress, and nutraceutical properties. These terms can be understood as follows-

Immunomodulator - A substance that alters the immune response by augmenting or reducing the ability of the immune system to produce antibodies or sensitized cells that recognize and react with the antigen that initiated their production (11). *Rasayana* drugs like *Adhatoda vasica* Nees (*Vasa*), *Asparagus racemosus* Willd. (*Shatavari*), *Boerhavia diffusa* L. (*Punarnava*), *Curcuma longa* L. (*Haridra*), *Embelia ribes* Burm. (*Vidang*), *Glycyrrhiza glabra* L. (*Yasthimadhu*), *Withania somnifera* (L.) Dunal (*Ashwagandha*), etc. have significant immunomodulatory action and have proved to be effective in boosting immunity (12,13)

Adaptogen - Natural herb products that supplement the body's ability to deal with stressors such as anxiety, fatigue, or trauma are called adaptogens (14). An adaptogen is a metabolic regulator which increases the ability of an organism to adapt to environmental factors and to avoid damage from such factors. Environmental factors can be either physiological (external), such as injury or aging, or psychological (internal), such as anxiety (15,16). *Withania somnifera* (*Ashwagandha*), *Andrographis paniculata* (*Kalmegh*), *Glycyrrhiza glabra* (*Yasthimadhu*), *Asparagus racemosus* Willd (*Satavari*), *Ocimum tenuiflorum* L. (*Tulsi*), *Piper longum* L. (*Pipul*), *Tinospora cordifolia* (*Guduchi*), *Embllica officinalis* (*Amla*),—*Terminalia chebula* (*Haritaki*) and *Sida cordifolia* (*Bala*) have significant adaptogenic and anti-stress activity (17,18).

Antioxidant - Antioxidants are defined as 'substances whose presence in relatively low concentrations significantly inhibits the rate of oxidation of targets' being present in serum, these antioxidants circumvent the damage caused by oxygen free radicals (19,20). e.g., *Triphala*, *Guggula*, *Haridra* etc. Oxidative stress leads to many pathophysiological conditions in the body. Some of these include neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease, gene mutations and cancers, chronic fatigue

syndrome, fragile X syndrome, heart and blood vessel disorders, atherosclerosis, heart failure, heart attack, and inflammatory diseases (21). Studies indicated that 70% methalcoholic extract of *Withania somnifera* (*Ashwagandha*) has the possibility as an antioxidant and free radical scavenging agent (22). *Centella asiatica* (*brahmi*), *Asparagus racemosus* Wild (*Shatavari*), *Acorus calamus* Linn. (*vacha*), *Bacopa monnieri* (Linn) wettst. (*Nirbrahmi*), *Celastrus peniculatus* Willd. (*Mal-kangani*), *Convulvulus pleuricaulis* Choisy. (*Shankhpushpi*) and *Curcuma longa* Linn. (*Haldi*) are proven antioxidants (23).

Nootropic - These are substances that promote intelligence and functions of the brain. These drugs can be categorized as *Medhya Rasayana* drugs. *Acharya Charaka* has described four important *Medhya Rasayana* drugs namely- *Mandukparni*, *Guduchi*, *Yash-timadhu*, and *Shankhpushpi* (24).

Nutraceutical action - Nutraceutical, a portmanteau of the words "nutrition" and "pharmaceutical", is a food or food product that provides health and medical benefits, including the prevention and treatment of disease (25). *Rasayana* provides adequate nutrition to every cell or tissue of the body. They increase plasma

nutrient value thus executing great nutraceutical action. This action of *Rasayana* drugs was evident in P. Bansal *et al* (21).

Traditionally, '*Rasayana*' drugs are used against a plethora of seemingly diverse disorders with no pathophysiological connections according to modern medicine. Looking at these diverse applications, adaptogenic agents from this group of '*Rasayana*' were identified (15). It has been reported that the '*Rasayanas*' are rejuvenators, nutritional supplements and possess strong antioxidant activity. They also have antagonistic actions on the oxidative stressors which gives rise to the formation of different free radicals. Therefore, the therapeutic indication of these drugs can include the diseases relating to all the above systems. Their antistress/adaptogenic actions have made them therapeutically far more important (26). The majority of *Rasayana* drugs have biological activities which help in the achievement of *Vyadhikshamatva* through its *Dipana*, *Pachana*, *Medhya*, and immunomodulatory properties. Various *Rasayanas* as per their documented biological activities identified in this study is reported in table 1.

Table 1: *Rasayanas* as per their documented biological activities

Documented activity	Mechanism of action	Documented Rasayana
Immunomodulatory activity	<ul style="list-style-type: none"> - Increase delayed-type hypersensitivity response (DTH), increase percentage neutrophil adhesion (27,28). - Improved cell-mediated immune response (29). - Enhance the macrophage membrane function (30) - Improved Th1/Th2 balance (31) 	<i>Anacyclus pyrethrum</i> (Akarkara) (27), <i>Azadiracta indica</i> A. Juss (Neem) (28), <i>Terminalia chebula</i> Retz. (Haritaki) (29), <i>Glycyrrhiza glabra</i> Linn. (Yashtimadhu) (30), <i>Triphala</i> (31)
Free Radical Scavenging /antioxidant activities	<ul style="list-style-type: none"> - The antioxidant action of enzymes like glutathione peroxidase, glutathione reductase (32) - Antioxidant action by inhibition of 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical (33) 	<i>Withania somnifera</i> (Ashwagandha) (32), <i>Acorus calamus</i> Linn.(Vacha) (33)
Nootropic activities	<ul style="list-style-type: none"> - affects the neurotransmitter acetylcholine or the areas of the nervous system that use acetylcholine which is a coordinator of memory formation(34) - increased total motor activity and stress-induced antinociception(35) - decreases retrograde amnesia and protects from phenytoin -induced cognitive deficit (35) 	<i>Bacopa monnieri</i> Linn (Brahmi) (34,35), <i>Convolvulus pluricaulis</i> Chois (Sankhapuspi) (35), <i>Withania somnifera</i> Dunal (Ashwagandha) (35), and <i>Centella asiatica</i> Linn (Mandukaparni) (35)
Radio-protective effect	<ul style="list-style-type: none"> - free radical scavenging, antioxidant, metal chelating and anti-inflammatory effects prevent radiation-induced clastogenesis(36–38) 	<i>Triphala</i> (37), <i>Brahma Rasayana</i> (36), <i>Ocimum sanctum</i> Linn (Tulsi).(38),
Anti-inflammatory action	<ul style="list-style-type: none"> - Strengthens the immune response by enhancing both cellular and humoral immunity, shows anti-inflammatory action. (39) 	<i>Ocimum sanctum</i> Linn (Tulsi) (39)
Anti-stress activity	<ul style="list-style-type: none"> - Exhibit anti-stress activity by strengthening the defense mechanism against free radical damage induced during stress (15,40) 	<i>Bacopa monnieri</i> Linn. (Brahmi) (33), <i>Emblica officinalis</i> Gaertn.(Amalaki) (15)
Anti-cancer property	<ul style="list-style-type: none"> - Activation of p53 and pRB (tumor suppressor protein) (41) - Antitumor against Ehrlich Ascites carcinoma in mice (42) 	<i>Withania somnifera</i> (Ashwagandha) (41), <i>Bacopa monnieri</i> Linn. (Brahmi) (42)
Aphrodisiac activity	<ul style="list-style-type: none"> - Testosterone-like effects, revitalizing and rejuvenating properties (23) 	<i>Withania somnifera</i> (23)

CONCLUSION

Rasayana drugs mentioned in *Ayurveda* have sufficient literature and possibilities to serve both for the prevention and cure of many diseases. The biological properties of these *Rasayana* have clinical evidences and research showed significant results in subsiding clinical symptoms and reduce the progression of the disease process. Taking leads and learning from *Ayurveda* and traditional medicine future studies should be planned which will help in reducing time in drug discovery. The evidence-based biological properties of *Rasayanas* discussed in this review article must be utilized to the greatest extent with the incorporation of fundamentals of traditional medicine and modern advance research techniques. This research approach using pre-clinical and clinical trials is a need of the hour to ensure the evaluation of the safety and efficacy of this poly-herbal formulation.

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