



## IMMUNOMODULATORY EFFECT OF AYURVEDIC DIET -AN OVERVIEW

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(Published Online: March 2023)

## Open Access

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Article Received: 08/02/2023 - Peer Reviewed: 18/02/2023 - Accepted for Publication: 09/03/2023.



## ABSTRACT

Immunity is a matter of concern everywhere especially when the existence of the whole world is threatened by various epidemics and pandemics. Immunity is the state of having sufficient biological defences to avoid infection, disease, or another unwanted biological invasion. It is the capacity of the body to resist disease formation. An immunomodulator may be defined as a substance, which can influence any constituent or function of the immune system in a specific or nonspecific manner including either innate or adaptive arms of the immune response. *Vyadhikshamatwa* is a concept in Ayurveda that can be related to immunity. The use of herbs for improving the overall resistance of the body against common infections and pathogens has been a leading principle of Ayurveda. Herbs possessing immunomodulatory effects are referred to as *Rasayana* (rejuvenating or revitalizing) in Ayurvedic classics *Ahara* (food) and *Vihara* (regimens) are key factors in improving *Vyadhikshamatwa* (immunity). In Ayurveda *Nityopayogidravyās* (food that can be consumed daily) are detailed and many of them has *Rasayana* property also. This paper is a review of the various concepts of immunomodulatory action of the Ayurvedic diet which has been told as *Nityopayogi* (to be used daily) with the pharmacological studies conducted so far in this arena.

**Keywords:** Immunity, Immunomodulation, *Vyadhikshamatwa*, *Rasayana*, *Nityopayogidravyas*

## INTRODUCTION

Immunity is a condition of being able to resist a particular disease especially through preventing the development of a pathogenic microorganism or by counteracting the effects of its products<sup>1</sup>. It is broadly classified as active and passive. Active immunity is the immunity that an individual develops as a result of infection or by specific immunization and is usually associated with the presence of antibodies or cells having a specific action on the microorganism concerned with a particular infectious disease or on its toxin<sup>2</sup>. Active immunity includes Humoral immunity, Cellular immunity, and a combination of both. When antibodies produced in one body are transferred to another to induce protection against disease, it is known as Passive immunity. It includes normal human Ig, specific human Ig, animal antitoxins, or antisera. Immunomodulation refers to the modulation of the immune system either natural or any other human-induced forms or it refers to any process in which an immune response is altered to a desired level. Immunomodulators are considered now as one of the most potent tools in the management of health and disease by modern medicine. Immunomodulators are of mainly two types immunostimulants and immunosuppressants. They can be natural or artificial. The immunomodulatory effect of certain dietary elements and exercise is widely accepted and used as an adjuvant in treatment.

### Concept of immunomodulation in Ayurveda:

Ayurveda has propounded the concept of immunity as *Vyadhikshamatwa*. Acharya Chakrapanidatta has interpreted the term *Vyadhi-kshamatva* as *Vyadhibalavirodhitwa* i.e., antagonistic to the strength and virulence of the disease, and *Vyadhyutpadaka Prati-bandhakatwa* i.e., the capacity to inhibit and bind the causes and factors of the disease<sup>3</sup>. The main elementary components of *Vyadhikshamatwa* are *Sahaja*, *Kalaja*, and *Yuktikritabalam*. *Sahaja vyadhikshamatwa* is the immunity that is present at birth itself, also called *Prakruthabala*, and can be related to innate immunity. *Kalaja* and *Yuktikrutabala* come under *Aarjita vyadhikshamatwa* or acquired immunity, that

one acquires during his lifetime. *Yuktikritavyadhikshamatwa* can be enhanced with suitable *Ahara*, *Vihara* and use of *Rasayanas*. *Dinacharya*, *Ritucharya*, *Nishacharya*, etc. are regimens told in Ayurveda or *viharas* which enhance *Bala* or *Vyadhikshamatwa*. One of the therapeutic strategies in Ayurvedic medicines is to enhance the body's overall natural resistance to the disease-causing agent rather than directly neutralizing the agent itself. The use of herbs for improving the overall resistance of the body against common infections and pathogens has been a guiding principle of Ayurveda. *Aharas* that can be taken daily are termed *Nityopayogidravayas* and many of them have *Rasayana* property also. They enhance *bala* and can be considered powerful and cost-effective immunomodulators.

The list of *ahara* which has to be used daily are:

1. *Sali*: a variety of paddy which is red in colour. *Botanical name-Oryza longistaminata (Family-Poaceae)*
2. *Godhuma* (wheat): *Botanical name-Triticum aestivum(Family-Poaceae)*
3. *Yava*(barley): *Botanical Name-Hordeum vulgare(Family-Poaceae)*
4. *Sashtika*: a variety of paddy. *Botanical name-Oryza Sattiva (Family-Poaceae)*
5. *Jaangala mamsa*: condiments prepared from meat of animals of *jangaladesa*(dry, marshy areas)
6. *Sunishannaka*(amaranthus): *Botanical name-Marsilea quadrifolia(Family-Marsilaceae)*
7. *Jivanti*: *Botanical name-Holostemma adakodien.(Family-Asclepediaceae)*
8. *Balamulaka*: immature radish. *Botanical Name – Raphanus sattivus.(Family-Brassicaceae)*
9. *Vastuka*: basil. *Botanical name-Chenopodium album(Family-Amaranthaceae)*
10. *Pathya/Haritaki*: *Botanical name-Terminalia chebula Retz.( Family-Combretaceae)*
11. *Amalaki*: *Botanical name-Emblica officinalis Gaertn.(Family-Euphorbiaceae)*
12. *Mrudweeka*-grapes. *Botanical name-vitis vinifera. (Family-Vitaceae)*

13. Patola-snakegourd. Botanical name-Trichosanthus anguina. (Family-cucurbitaceae).  
 14. Mudga-green gram. Botanical name-Vigna radiata. (Family-Fabaceae)  
 15. Sarkara-sugar  
 16. Ghrita-ghee  
 17. Divyodaka-pure rainwater

18. Ksheera-milk  
 19. Kshoudra-honey  
 20. Dadima-pomegranate. Botanical name-Punica granatum. (Family-Punicaceae)  
 21. Saindhava-rock salt

DRUG	AYURVEDIC PROPERTIES
Rakta Sali	Best among shukadhanya, pacifies trishma(thirst), tridosahara(pacifies tridoshas)
Godhuma	Vrushya(aphrodisiac), seeta(cold inside the body), guru (heavy to digest), snigdha(guna (increase unctuousness), Jeevana, vatapitta haram(pacifies vata and pitta), sandhanakara (used in treating wounds and fractures), Sthairyakrit (increases strength), saram(laxative)
Yava	Ruksha(dry), seeta(cold), guru(heavy to digest), madhura (sweet), sara (laxative), vrushya (aphrodisiac), sthairyakaram (enhance strength), vitvatakrit(increase vayu and stool), controls diseases of the urinary tract, correct disorders of fat metabolism, pitta, and kapha doshas.
Sashtika	Superior among vreehidhanya, snigdha(increase unctuousness), grahi(causes constipation), guru(heavy)(aguru by charaka), madhura(sweet), tridoshagna(pacifies tridoshas), sthira(give stability)
Jangalamamsa	Madhura and kashayarasa, laghu(light to digest), seetaveerya(increase cold inside body), hitanrinaam(good for everyone)
Sunishannaka	Grahi (causes constipation), tridoshagna (pacifies tridosha), agnikrit (increases digestive fire), vrushya (aphrodisiac)
Jivanti	Chakshushya (good for eye health), sarvadoshahara(pacifies all doshas), madhura(sweet), sita(cold)
BaalaMoolaka	Avyakta rasa (not pungent taste), kinchitkshara (astringent), satiktaka (a little bit bitter), tridosahara (pacify tridosha), laghu (light), ushna (hot in body)
Vastuka	Tridosahara(pacifies tridosha), laghu(light), laxative
Pathya	All rasa except lavana mainly-kshaya. madhuravipaka, ruksha, laghu, deepana, pachana, medya, vayasthapaneeparam, ushnaveryam, saram, ayushyam, budhiindriya balapradam.
Amalaki	Seeta, amla, pittakaphasamana, rasayana
Mrudweeka	Vrushya, chakshushya, srishta mutra, tikta madhura rasa and vipaka, snigdha, seeta, guru
Patola	Hridyam, krimihara, madhuravipaka, ruchiprada
Mudga	Sreshtha among simbidhanya, alpavatavardhana, kashayamadhura rasa, katuvipaka, laghu seeta guna, grahi
Sarkara	Pacifies daha, trushna, chardi, murcha, raktapitta.
Ghrita	Vayasthapanam param, seeta, snehanamuttamam, dheer smriti agni, bala ayu vardhana, swaryam, vata pitta vishasamana
Divyodaka	Jeevanam, tarpanam, hridyam, budhiprabodhanam, hlaadanam, avyaktarasam, laghu, seetam, amrutopamam
Ksheera	Swadu rasa and veerya, snigdha, ojasyam, dhatuwardhana, guru, seetam, vatapitta haram, vrushyam, kaphavardhana, jeevaneeyam, rasayanam
Kshoudra	Chakshushya, chedi, trishnakaphavishasamanam, vranasodhana, sandhana, ropana, kashayamadhuram, ruksha, Vatalam.
Dadima	Madhura rasam, tridosha haram, hridyam, laghu, snigdha, grahi, deepana, Rochana
Saindhava	Madhura rasam, laghu, Anushna, vrushyam, Hrudyam, tridosaharamdeepana, Avidahi, good for eyes.

Here is the list of some of the drugs investigated for immunomodulatory effect:

DRUGS	IMMUNOMODULATORY EFFECT
<i>Amalaki</i> (Amla) (Botanical Name- <i>Embllica officinalis</i> )	<ul style="list-style-type: none"> <li>- Stimulates PMN cells and RE system [4]</li> <li>- Inhibits PMN activity induced by leukotriene B4 and FMLP [5]</li> <li>— Protects against pancreatitis [6]</li> <li>- Induces positive nitrogen balance [7]</li> <li>- Protects against the toxic effects of metals [8]</li> <li>- Enhances NK cell and antibody-dependent cellular cytotoxicity against Dalton's lymphoma ascites tumour [9]</li> </ul>
<i>Padhya/Hareetaki</i> (Botanical name- <i>Terminalia chebula Retz.</i> )	<ul style="list-style-type: none"> <li>- increase in the concentration of antioxidant enzymes, GSH, T, and B cells, the proliferation of which play important roles in immunity. [10]</li> <li>-enhances the concentration of melatonin in the pineal gland as well as the levels of cytokines, such as IL-2, IL-10, and TNF-<math>\alpha</math>, which play important roles in immunity. [10]</li> </ul>
<i>Godhuma</i> (wheat) <i>Botanical Name-Triticum aestivum</i>	<ul style="list-style-type: none"> <li>- a significant increase in the phagocytic index and a significant protection against cyclophosphamide-induced neutropenia indicating its effect on cell-mediated immunity and humoral immunity.[11]</li> <li>-may stimulate self-mediated immunity as shown by the increase in Macrophage induced Phagocytosis in the carbon clearance test and reduction in cyclophosphamide-induced neutropenia. .[11]</li> <li>-Triticum aestivum water extract upregulated the cytokines (TNF-<math>\alpha</math>, IL-2, and IFN- <math>\gamma</math>) and Th2 cytokine (IL4). [12]</li> <li>- IL-1<math>\beta</math> (a th cytokine) and P65 subunit of NFkBwere suppressed in groups treated with Triticum lestivum. Moreover, Triticum aestivum extract restored Prednisolone suppressed TNF--<math>\alpha</math> and IL-2:ytokines. Triticum aestivum appears to have a significant role in immunity and our findings confirm its beneficial role in hemoglobin concentration.[12]</li> <li>-After further purification and structural analysis, maltoheptaosewas identified from WG-PS3 as an immunomodulator.[13]</li> </ul>
<i>Yava</i> (Barley) (Botanical Name- <i>Hordeum vulgare</i> )	<ul style="list-style-type: none"> <li>-BP-1 could increase the serum levels of IL-2, TNF-<math>\alpha</math>, and IFN-<math>\gamma</math>, so as to improve the immune function of immunosuppressive mice. The results showed that BP-1 (80 mg kg-1 and 160 mg kg-1) could promote the proliferation of spleen cells and the natural killer (NK) cell activity in vivo.[14]</li> <li>-the result of macrophages showed that BP-1 (80 mg kg-1 and 160 mg kg-1) could promote the proliferation and phagocytosis activity of macrophages in immunosuppressive mice.[14]</li> <li>-Barley and its extracts are rich in 30 ingredients to combat more than 20 chronic diseases, which include the 14 similar and 9 different chronic diseases between grains and grass, due to the major molecular mechanism of six functional ingredients of barley grass (GABA, flavonoids, SOD, K-Ca, vitamins, and tryptophan) and grains (<math>\beta</math>-glucans, polyphenols, arabinoxylan, phytosterols, tocols, and resistant starch).[15]</li> <li>-barley grain and its grass are the best functional food, promoting ancient Babylonian and Egyptian civilizations, and further show the depending functional ingredients for diet from Pliocene hominids in Africa and Neanderthals in Europe to modern humans in the world.[15]</li> </ul>
<i>Sunnishannaka</i> (Botanical Name- <i>Marsilea quadrifolia</i> )	<ul style="list-style-type: none"> <li>-Saponins can impact the immune system through their adjuvant activity, their ability to improve the effectiveness of orally administered vaccines by facilitating the absorption of large molecules, and their immunostimulatory effects.[16]</li> <li>-Saponins have possessed a number of pharmacological actions including, immunomodulatory potential via cytokine interplay, cytostatic and cytotoxic effects on malignant tumor</li> </ul>

		<p>cells, and adjuvant properties for vaccines as immune stimulatory complexes.[16]</p> <p>-numerous medicinal effects, including antioxidant, vasoprotective, anti-inflammatory, antiviral, antibacterial, and antitumor.[16]</p> <p>-ethanolic extract of <i>Marsilea quadrifolia</i> had increased the stress tolerance indicating their anti-stress activity.[17]</p> <p>-powerful antioxidant and free radical scavenging activities.[18]</p>
<i>Jivanti</i> (Botanical Name- <i>Holostemmaadakodien</i> )		<p>-Hypoglycemic and Antidiabetic activity; Antipyretic Activity; Antibacterial; Anti-inflammatory Activity and Antioxidant activity are shown by <i>Holostemmaadakodien</i> Shcult.[19]</p> <p>-It contains terpenoid sugar which has been studied for its various medicinal activities such as antipyretic, antioxidant, antidiabetic, hepatoprotective, antibacterial, and anthelmintic activity.[20]</p>
<i>Patola</i> (Botanical Name- <i>Trichosanthesanguina</i> )		<p>-Aqueous extract of the <i>Tricosanthes Dioica</i> Roxb. showed increasing antibody production in a dose-dependent manner. It enhances the production of RBC, WBC, and hemoglobin[21]</p> <p>-Effect of RIP on various cancer lines includes Carcinoma, leukemia/lymphoma, tumor cell, cervical choriocarcinoma, and breast tumor cells. RIP is active against these cell lines either by inhibition or by Apoptosis. It can be also used against free radicals, in the heart diseases, liver disorders, ulcers, diabetes, cholesterol, and skin disorders.</p> <p>Trichosanthes species also have good potential. sources of antioxidants and minerals. [22]</p>
<i>Mudga</i> (green gram) <i>Vigna radiate</i>		<p>-Hemicellulose B was relatively rich in carbohydrate content (~95%) and also possessed potent immunomodulatory activity among the various NSPs. [23]</p> <p>-ammonium carbonate (0.1, 0.2, 0.3 M AC) and sodium hydroxide (0.1 and 0.2 M NaOH). 0.1 M AC eluted fraction was found to be the major one amounting to ~ 50% yield and showed relatively significant (<math>p &lt; 0.001</math>) activity towards splenocyte proliferation and macrophage activation as compared with the rest of the DEAE eluted fractions.[23]</p> <p>-regular consumption of mung beans could regulate the flora of enterobacteria, decrease the absorption of toxic substances, reduce the risk of hypercholesterolemia and coronary heart disease, and prevent cancer.[24]</p> <p>-study accomplished that sprouted <i>Vigna radiata</i> L. inhibits anemia induced by phenyl hydrazine model similar to those induced by parasites such as <i>Plasmodium falciparum</i>. This result supports at least partially the traditional use of sprouted <i>Vigna radiata</i> L. in the treatment of anemia. [25]</p>
<i>Mridweeka/Draksha</i> (Botanical Name- <i>Vitis vinifera</i> )		<p>-Polyphenols contained in FGM from Negroamaro (N) and Kosu (K) <i>Vitis vinifera</i> have been shown to exhibit several immunomodulating activities. [26]</p> <p>In another set of experiments both N- and K-FGM were able to balance the rate of proliferation/apoptosis/necrosis of normal human peripheral lymphocytes, thus indicating the property of these compounds to maintain immune homeostatic mechanisms in the host. [26]</p> <p>Seed extract inhibited IL-8 and NF-<math>\kappa</math>B pathways, showing higher potency with respect to the fruit. Although the main effect was due to the presence of seeds, the fruit showed significant activity as well. Our data suggest that the consumption of selected varieties of raisins could confer a beneficial effect against gastric inflammatory diseases. [27]</p>

## CONCLUSION

The modulation of immune response by using Ayurveda as a possible therapeutic measure has now become a subject of scientific investigation. Immuno-

modulators are considered now as one of the most potent tools in the management of health and disease by modern medicine. Most recent knowledge of the neuro-endocrine – immune axis or the influence of exercise, circadian rhythms, seasonal variations, and different psychological states on the immune system are unfolding many such issues which are bringing the modern concepts closer to Ayurvedic principles of Vyadhi-kshamatwa, Ojas, and Bala. Ayurveda's emphasis on the role of Dosas and their imbalance as the main causative factor of diseases assumes importance in light of the fact that the mere presence of causative organisms in the environment does not necessarily results in the manifestation of the disease. The concepts of Ojas and Bala, of the inherent immunological capabilities including innate immunity and acquired immunity in terms of Sahajabala and Yuktikritabala, etc., playing a key role in the health and disease have to be understood by everyone in the world. The implementation of an Ayurvedic diet or *Ahara* told as *Nityopayogidravyas* and *Viharas* can significantly serve as immunomodulatory agents which can help prevent and protect from many diseases.

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**Source of Support: Nil**

**Conflict of Interest: None Declared**

How to cite this URL: Aparna Anand: Immunomodulatory Effect of Ayurvedic Diet -An Overview. International Ayurvedic Medical Journal {online} 2023 {cited March2023} Available from: [http://www.iamj.in/posts/images/upload/627\\_633.pdf](http://www.iamj.in/posts/images/upload/627_633.pdf)