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AN OVERVIEW OF EFFECT OF SIDDHA IMMUNOMODULATORS AGAINST VARIOUS DISEASES AND INFECTIONS

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ABSTRACT

Immunomodulator means an alteration of immune response may cause increase or decrease the immune responses. In all over the world a lot of medicinal plants are employing in various system of medicine to improve the immune disorders. From time immemorial in Siddha system, they have used various plants for rejuvenation and immunomodulation to prevent diseases and improved their longevity of life. This review gives some of the medicinal plants sources, description, active components, indications, method of use and dosage and recent research about that plant and related information of those plants such as Aegle marmelos, *Allium sativum, Aloe vera, Citrus aurantium, Curcuma longa,* Ficus bengalensis, Glycyrrhiza glabra, *Nigella sativa, Ocimum sanctum,* Solanum xanthocarpum, etc. and their single and compound herbal formulations of those plants are also discussed in detail.

KEYWORDS: Immunomodulator, medicinal plants, rejuvenator, Siddha system of Medicine.

INTRODUCTION

Immunomodulator means an alteration of immune response may cause increase or decrease the immune responses. Immunomodulator is defined as a substance, biological of synthetic, which stimulate, suppress or modulate any of the components of the immune system including both innate and adaptive arms of the immune response.[1, 2]Today the reality is that a poor and improper diet is the main source of many diseases including cardiovascular diseases, osteoporosis, obesity, diabetes, hypertension and cancer etc. At the same time, a healthy and balanced diet can meet the nutritional needs while contributing to the prevention of all the above diseases.Hence, in Siddha system of medicine, a good and balanced diet is considered as the first drug of choice for most of the disease.

The great Tamil poet and philosopher *'Thiruvalluvar'* insisted the importance of diet in causation of disease. According to his statement, not only the adequate energy content of the food, but also its composition plays an important role in keeping the body healthy.So a healthy body provides the basic platform for all human activities, efficiency and performance. Proper foods only contain intrinsic elements allowing the body to remain healthy.To achieve this health, proper diet combine with a healthy lifestyle, many plant products are mandatory. Strengthening the immune system through proper nutrition and plant medications is the better way to maintain the health state.

classification of immunomodulators

In clinical aspect it can be classified into 3 categories,

Immuno Adjuvants

Immuno adjuvant is a component that potentiates the immune responses to an antigen and/or modulates it towards the desired immune response.[3]These are used to enhance vaccine efficacy. These are the true modulators of immune system. There are many oil based adjuvants are commonly used to enhance some human vaccines obtained from plant and animal sources including amaranth seeds, pumpkin and olive oil.[4]

Immunostimulants

Immunostimulants also known as immune stimulators are drug or nutrient substances inherently non - specific in nature and stimulate the immune system by exerting increased body resistance against infection. The immune stimulants are expected to serve as prophylactic and promoter agents and serve as immunotherapeutic agents. These non-specific immune stimulants do not have antigenic specificity and are widely used in chronic infections, immunodeficiency, autoimmunity and neoplastic diseases.

Immunosuppressants

An immunosuppressant is any agent that causes immunosuppression, including immunosuppressive drugs and some environmental toxins. Immunosuppression involves an act that reduces the activation or efficacy of the immune system. In general, deliberately induced immunosuppression is used in the treatment of autoimmune diseases such as rheumatoid arthritis, Crohn's disease and organ transplant rejection.[5]

The benefits of immunomodulators root from their ability to stimulate defense mechanism such as cytokines which enables the body to help itself.[6] There is an excessive need for understanding plant based drug immunological profile. Because many phytoconstituents from plants like polysaccharides act through many mechanisms like complement activation, proliferation of lymphocytes and stimulation of macrophages. The natural immunomodulators act to either strengthen or weak immune systems and to moderate systems that are overactive.

Plants from Siddha system of medicine with immunomodulator potentials

Medicinal plants from Siddha system of medicine are used from time immortal to increase and strengthening the defense mechanism in a natural way without side effects. In Siddha system of medicine most of the anti-bacterial, anti-viral, anti-cancer, anti-histamine and bronchodilator plants have effective therapeutic potentials with enhanced immune function and such drugs are termed as immunomodulators.

A lot of scientific effort has been made to validate the many medicinal plants as immunomodulatory agents. Numerous immune enhancing substances have been isolated from plants and open the door for the development of novel drugs. [7]Hence, the present article considered the results of different investigations have focused on medicinal plants active on the immune system with potential applications in the field of immunomodulatory therapy.Though the scientific evidence is still scant, this article is aimed to provide with existing point to the use of safe and effective medicinal plants in the prevention and treatment of various immune related disorders.

MATERIALS AND METHODS

The data's were collected from various Siddha classical texts, manuscripts and research details were collected from several books and research journals to get sufficient information. The medicines are given below under single herbal therapy and compound herbal formulation titles separately.

Some of the medicinal plants act as an Immunomodulator

S.No	Plant name	Family	Part used	Immuno modulatory mechanism
1.	*Acorus calamus* L.[8A]	Araceae	Rhizome	Increase the production of IL-2, tumour necrosis factor (TNF) –α[11]
2.	*Allium sativum* L.[8B]	Alliaceae	Bulb	Suppress leukocyte inflammatory cytokine production[12]
3.	*Aloe vera*(L.) Burm.f.[9A]	Liliaceae	Leaf pulp	Increases phagocytosis and stimulating the production of superoxide[13]
4.	*Andrographis paniculata* Wall. ex Nees[8C]	Acanthaceae	Aerial parts	Increase the production of IL-2, inhibits of NO production[14]
5.	*Asparagus racemosus*Willd.[8D]	Liliaceae	Root tuber	Increases the production of leukocytosis , Enhances the phagocytic activity of the macrophages[15]
6.	*Azadirachta indica* Juss.[9B]	Meliaceae	Leaves	Increase IgM and IgG production, Inhibits NO synthesis, degranulation of neutrophils[16]
7.	*Boerhaavia diffusa* L.[9C]	Nyctaginaceae	Root	Inhibits human NK cell cytotoxicity in vitro, Inhibits production of NO, IL-2 and TNF-α[17]
8.	*Boswellia serrata* Roxb.ex.Colebr[8E]	Burseraceae	Bark	Inhibits passive paw anaphylaxis reaction and mast cells protection[18]
9.	*Calendula officinalis* L.[8F]	Asteraceae	Leaves & Flowers	Inhibits tumour cell proliferation[19]
10.	*Camellia sinensis*(L.) Kuntze[8G]	Theaceae	Leaves	Enhances the neopterin production in peripheral mononuclear cells[20]
11.	*Capparis zeylanica* L.[8H]	Capparidaceae	Leaves	Prevents myelo suppression in mice with cyclophosphamide & potentiates DTH reaction[21]

12.	*Carica papaya* L.[8I]	Caricaceae	Leaves & seeds	It enhances the phytohaemagglutinin responsiveness of lymphocytes[22]
13.	*Centella asiatica* L.Urban.[10A]	Umbelliferae	Leaves	It increases the phagocytic index, total WBC count & inhibits human peripheral blood mononuclear cell[23]
14.	*Chrysanthemum indicum* L.[8J]	Asteraceae	Aerial parts	Increases DTH reaction, antibody generation, potentiates the mononuclear phagocytosis function[24]
15.	*Citrus aurantiifolia*(Christm.) Swingle[8K]	Rutaceae	Fruits & Leaves	Inhibits proliferation of PHA activated mononuclear cells, staphylococcal protein [25]
16.	*Curcuma longa* L.[8L]	Zingiberaceae	Rhizome	Shows immunomodulation through inhibition of proliferation induced by PMA and anti-CD28 antibody[26]
17.	*Eclipta prostrata* L.[10B]	Asteraceae	Whole plant	Induces phagocytic index, antibody titer of mice & increase non-specific immune response [27]
18.	*Phyllanthus emblica* L.[9D]	Euphorbiaceae	Fruits	Immunosuppressive effects on lymphocyte proliferation &restoration of IL-2 and IFN-γ production[28]
19.	*Evolvulus alsinoides* L.[10C]	Convolvulaceae	Whole plant	Decreases the nitric oxide synthase (NOS), exert adaptogenic properties [29]
20.	*Ficus benghalensis* L.[9E]	Moraceae	Whole plant	Enhance the phagocytosis of the human neutrophils in vitro & increase the antibody titer value[30]
21.	*Glycyrrhiza glabra* L. [8M]	Fabaceae	Root bark	Stimulates immune cells by CD69 expression on CD4 and CD8 T cells and macrophages function[31]
22.	*Jatropha curcas* L.[8N]	Euphorbiaceae	Leaves	Increase the antibody titers, lymphocyte and macrophage cells[32]
23.	*Mangifera indica* L.[8O]	Anacardiaceae	Fruits	Increase in humoral antibody titre&DTH, enhance production of IgG1 & IgG2b[33]
24.	*Momordica charantia* L.[8P]	Cucurbitaceae	Fruits & seeds	Inhibits the release of TNF-α, NO and proliferation of spleen cells induced by PHA and Con A[34]
25.	*Morinda citrifolia* L.[8Q]	Rubiaceae	Fruits	Stimulating the release TNF-α, IL-β, IL-10, IL-12, IFN-γ[35]
26.	*Nelumbo nucifera* Gaertn.[9F]	Nymphaeceae	Rhizome & seed	Protects mast cells degranulation express CD40, CD80, CD86[36]
27.	*Nerium oleander*L.[8R]	Apocynaceae	Leaves	Inhibited haemaglutination antibodies, DTH reaction, phagocytic index etc., [37]
28.	*Nigella sativa*L.[8S]	Ranunculaceae	Seeds	Reduces pancreatic ductal adenocarcinoma cell (PDA) synthesis of monocyte chemo attractant protein - 1 (MCP-1), TNF-α, IL-1β and cyclooxigenase (COX) – 2 [38]
29.	*Piper longum*L. [8T]	Piperaceae	Fruits & leaves	Increases the total WBC count, bone marrow cellularity, enhance the total antibody production[39]
30.	*Psoralea corylifolia* L.[8U]	Fabaceae	Seeds	Up regulates the production of OVA – specific Th1 cytokine (IFN-γ) & down regulated OVA – specific Th2 cytokine[40]
31.	*Punica granatum* L.[8V]	Punicaceae	Fruits	Inhibits the leucocyte migration[41]
32.	*Rhinacanthus nasutus* (L.) Kurz[8W]	Acanthaceae	Whole plant	Increased the production of IL- 2 and TNF –α[42]

33.	*Salvia officinalis* L.[8X]	Lamiaceae	Aerial parts	Induce rat thymocyte proliferation[43]
34.	*Tamarindus indica* L.[8Y]	Fabaceae	Fruits	Inhibits the phorbolmyristate acetate (PMA) stimulated neutrophil function, neutrophil NADPH oxidase activity, elastase activity[44]
35.	*Terminalia chebula* Retz.[10D]	Combretaceae	Fruits	Increase in HA titer and DTH reaction[45]
36.	*Tinospora cordifolia* (Willd.) Miers[10E]	Menispermaceae	Stem & root	Increase the total white blood cell count, bone marrow cellularity and α-esterase positive cells [46]
37.	*Trigonella foenum–graecum* L.[8Z]	Fabaceae	Seeds	Increases the phagocytic index and phagocytic capacity of macrophages, enhancement of thymus and bone marrow cellularities[47]
38.	*Withania somnifera* (L.) Dunal[9G]	Solanaceae	Root	Increase total WBC count, bone marrow cellularity, circulating antibody titer & plaques forming cells in the spleen [48]

SINGLE HERBAL REMEDIES

1. *Aegle marmelos* (Family: Rutaceae)

Common name: Eng- Bael fruit tree, Bengal quince, Golden Apple, Holy Fruit, Indian quince, Stone Apple; Sans –Bilva ; Hind – Bel ; Tam- Vilvam.

Source: Throughout India in dry hill areas, gardens and road sides; cultivated various places in India.

Description: A spinous, deciduous, aromatic tree, about 12m high; spines straight, strong, axillary. Leaves 3-foliate, sometimes 5-foliate. Terminal long petiole, axillary panicles, fruits upto 15cm long.

Parts used:Fruits, seeds, leaves, bark and root,

Active constituents: Lupeol, 1-phenyl-7-hydroxy-tetrahydro-quinazolin-4-one, skimmianine, marmin and marmelide.[49]

Indications: Root of *Aegle marmelos* is one of the ingredients of *Dhasamoolam particularly* useful in loss of appetite. Leaves are efficacious in bronchial asthma.It improves general immunity. It has an anti-ageing property.[50]

Method of use & dosage: The root as well as the bark is used in the form of a decoction as a remedy in intermittent fever and palpitation of the heart. It acts as an immunomodulator. Dose.30-60ml twice a day.

Research: Immuno modulatory effect of *Aegle marmelos* leaf extract on fresh water fish *Cyprinus carpio* infected by bacterial pathogen *Aeromonas hydrophila* at a dose of 1.5 × 104cells/ml through intra peritoneal injection significantly enhanced the red blood cell count, white blood cell count, hemoglobin, phagocytic activity, nitro blue tetrazolium chloride assay, lysozyme, pathogen clearance and enzyme activity compared with control group. *Aegle marmelos* stimulates the immunity makes the fresh water fish *Cyprinus carpio* more resistant to *Aeromonas hydrophila*.[51]

2. *Allium sativum* (Family:Amaryllidaceae)

Common name:Eng: Garlic, Churl's Treacle, Poor man's treacle; Sans: Lasuna; Hind: Lasun; Tam: Vellaipoondu, Vellulli.

Source: Cultivated throughout India.

Description: Leaves flat, scape slender, spathes long beaked, heads bearing bulbils and flowers, sepals lanceolate, acuminate, inner filaments 2 toothed.

Parts used: Bulb

Active constituents:Allicin (thio-2-propene-1-sulfinic acid-S-allyl ester), γ - glutamyl- phenylalanine, scordine and scardinines A_1, A_2 and B, leucine, methionine.

Indications:Garic is a powerful and natural immunomodulator. The bulb is tonic, aphrodisiac, flattening *and digestive* properties. *It reduces* the fever, bronchitis, inflammation, piles, leucoderma, asthma, tumours, epileptic fits, thirst, ear ache. Garlic prevents and/or treats the common cold. Garlic preparations were generally well tolerated with very few side effects.

Method of use & dosage: equal quantity of Garlic, pepper and *Eclipta prostrata* paste is a good immunomodulator. 2-5gms twice a day. [52A]

Research: Garlic has a significant effect on the immune system, increasing the activity of phagocytes lymphocyte especially CD_4phagocytosis can help protect cell membranes against damage usually chromosomal DNA, anti- virus, anti – infection. It enhances immunity to flu prevention.[53]

3. *Aloe vera* (Family: Liliaceae)

Common name:Eng:Indian Aloes, Burn Plantcuracao Aloe; Sans: Kumari; Hind: Ghikauvar; Tam: Katralai, kanni, kumari

Source: Aloe vera is widely cultivated throughout the world.

Description: It is a stemless or very short-stemmed succulent plant. It is growing upto 60–100 cm tall, spreading by offsets. The leaves are thick and fleshy, green to grey-green. The margin of the leaf is serrated and has small white teeth. The flowers are produced in summer on a spike up to 90 cm tall, each flower being pendulous, with a yellow tubular corolla 2–3 cm long.

Parts used: leaf pulp

Active constituents: Aloe vera leaves contain phytochemicals under study for possible bioactivity, such as acetylated mannans, polymannans,anthraquinone C-

glycosides, anthrones, other anthraquinones, such as emodin, and various lectins.
Indications: Oral administration of *Aloe vera* might be effective in reducing blood glucose in diabetic patients and in lowering blood lipid levels in hyperlipidemia. The topical application of aloe does not seem to prevent radiation-induced skin damage. It has a rejuvenating and immunomodulating properties. Aloe juice is used for treating burns, suppurative wounds and trophic ulcers. The leaf pulp is used in ointments, cosmetic creams and other lotions.
Method of use and dosage: Dried powder of aloe leaf pulp is a good immunomodulator. 2-4 gm twice daily. [52B]

Research: Extract suppressed delayed type hypersensitivity reaction induced by SRBCs in mice as evidenced by marked increased in haemagglutination titres in mice.[54]

4. *Citrus aurantium* L. (Family: Rutaceae)
Synonyms: *Citrus reticulata* Blanco
Source: Widely cultivated in India – Sikkim, Manipur, mountain forests of the Peninsula.
Description: A tree, rarely a shrub; young shoots glabrous, greenish white.Leaves slender, petiole short, naked or winged. Flowers white bisexual, fruits subglobose- globose, flattened on the top.
Parts used: Ripe fruit and flowers.
Active constituents: Glucoside hesperidin, d- linalool Carotenoids, provitamin A, vitamins B and C; γ – aminobutyric acid.
Indications: The peel is useful for checking vomiting and the prevention of intestinal worms. The dried outer portion of the rind of the fruit possess, stomachic and tonic properties. It acts as an immunomodulator. It is useful in atonic dyspepsia and general debility.
Method of use and dosage:Fresh fruit pulp is a good immunomodulator.1-2 twice daily [52C]
Research: *Immunomodulatory effect* of the extract was tested in mitogen activated cultured mononuclear cells. The culture results indicated that proliferation of phytohemagglutinin activated mononuclear cells was significantly inhibited by *Citrus aurantium* juice dose dependently. At the dose of 500 µg/ml of the extract could inhibit proliferation of staphylococcal protein A activated mononuclear cells.[25]

5. *Curcuma longa* (Family: Zingiberaceae)
Common name: Eng: Turmeric; Sans: Haridra; Hind: Haldi; Tam: Manjal
Source: Cultivated throughout the tropics, believed to be indigenous in Bihar 4500 – 5000 ft.
Description: A tall herb. Root stalk large, ovoid, with sessile cylindric tubers, orangecoloured inside. Leaves very large, flowers in autumnal spikes, 10-15cm. long; flowering bracts pale green.
Parts used: Rhizome
Active constituents: Curcuminoids, which include curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin. The best studied compound is curcumin, which constitutes 3.14% of powdered turmeric. Other important volatile oils include turmerone, atlantone and zingiberone.
Indications: In Indian system of medicine turmeric is used as a stomachic, tonic, and an immunomodulator. A fresh juice is commonly used in many skin conditions, including eczema, chicken pox and scabies. The active compound curcumin has an anti-inflammatory, antioxidant, anti tumour, antibacterial and antiviral activities.
Method of use & dosage: Turmeric is mixed with warm milk it is said to be beneficial in common cold. Decoction of the rhizome is having the same property. 15-30ml twice a day.[52D]
Research: *Curcumin plays* a major role for immunomodulatory activity. Bone marrow cellularity, alpha-esterase positive cells and macrophage phagocytic activity were enhanced by curcumin administration. Several evidences suggest that curcumin can modulate both the proliferation and the activation of T cells. It was reported that curcumin inhibits the proliferation induced by PMA and anti-CD28 antibody or that induced by PHA of T lymphocytes isolated from healthy donors. [55]

6. Ficus benghalensis (Family: Moraceae)
Common name: Eng- Banyan tree; Sans – vata; Hind- Bor, Beng; Tam - Aalamaram
Source: Throughout the plains and forest-tracts of India, planted in avenues for shade. Epiphytic when young and develops from seeds dropped by birds on old walls or on other trees.
Description: A very large ever green tree, extending laterally by sending down aerial roots. Bark smooth, light grey white, 1.27cm thick. Wood moderately hard, grey or greyish-white. Leaves ovate to elliptic; petiole 2.5-5.1cm; fruits sessile in pairspuberulous, subglobose, 1.3-1.9cm diam.
Part used: Roots, Seeds, Leaves, Latex, Bark and fruits.
Active constituents: Leaves yield quercetin-3-galactoside, rutin, friedelin and β – sitosterol. Bark contains leucoanthocyanin and two flavonoid compounds.
Indication: Leaves are effective in diabetes, dysentery, gonorrhea and in seminal weakness. Latex and leaves are enhancing the general immunity. It acts as a rejuvenator. Aerial roots are antiemetic. Seeds are cooling and tonic.
Method of use & dosage: Infusion of the bark is considered to be a good tonic.30-60ml twice a day.[52E]
Research: Immunomodulatory potential of methanol & water extracts of *Ficus benghalensis* exhibited a significant increase in the percentage phagocytic responses. In methanol extract was found to exhibit a dose related increase in the hypersensitivity reaction, to the sheep red blood cells antigen, at concentrations of 100 and 200mg/Kg. This extract significantly increased the antibody titre value dose dependently. [30]

7. *Glycyrrhiza glabra* (Family: Fabaceae)

Common name: Eng: Liquorice; Sans: Yashti - Madhukam; Hind: Jathi-madh, Mulath; Tam: Athimadhuram.

Source: Cultivated in Jammu and Kashmir, Punjab and Sub-Himalayan tracts.

Description: It is a tall perennial herb or under shrub upto 2 m. Roots thick, having many branches with red or lemon colour outside and yellowish or pale-yellow inside.

Parts used: Root

Active constituents: Glycyrrhizin, glycyrrhetinic acid, glycyrrhetic acid, 24 – hydroxyl glycyrrhetic acid, mixture of potassium and calcium salts of glycyrrhizinic acid

Indications: Root powder prescribed in coughs, hoarseness and in respiratory troubles. It is an immunomodulator, expectorant and tonic.

Method of use & dosage: Root powder is mixed with honey for general immunity. 2-4gm twice a day. [52F]

Research:The effects of crude polysaccharide fractions of the shoot and hairy root of Glycyrrhiza glabra induced nitric oxide production by murine peritoneal macrophages in vitro. The polysaccharide of *Glycyrrhiza glabra* dose dependently improved immune and antioxidant enzyme activities in mice. Glycyrrhizin (10) and β-glycyrrhetinic acid (11) are the major components of Glycyrrhiza glabra believed to have immunomodulatory properties.[56]

8. *Nigella sativa* (Family: Ranunculaceae)

Common name: Eng: Small fennel, Nigella seed; Sans: Upakunchika; Hind: Kulonji, kala-zira; Tam: Karunjeeragam.

Source: A native of Syria and Lebanon. Cultivated mostly in Punjab, Himachal Pradesh, Bihar and Assam.

Description: A small herb, 45 to 60 cm. high; Seeds, flattened, oblong, angular, rugulose, tubercular, about 0.2 cm. long and 0.1 cm. wide, black; odour slightly aromatic; taste bitter.

Parts used: Seeds.

Active constituents: Nigellinine – N-oxide, nigellicine, arenasterol-5-ene, lophenol, α-hederin and fatty acids.[49B]

Indications: The seeds when bruised are strongly scented, and they are used as emmenagogues, diuretics, galactogogues and immunomodulators. They are carminative & are an excellent adjunct to purgative draughts.

Method of use & dosage: Powdered seeds mixed with water for immunity. 1-2gm twice daily. Essential oil from seed is used in common cold and cough.[52G]

Research: The seed oil of *Nigella sativa was* identified as thymoquinone (20) which possess potent anti-inflammatory effects on several inflammation based models including experimental encephalitis, colitis, peritonitis, oedema and arthritis through suppression of the inflammatory mediators prostaglandin and leukotriens. Thymoquinine showed beneficial immunomodulatory properties through augmenting the T-cell and natural killer cell mediated immune responses.[38]

9. *Ocimum sanctum*(Family: Lamiaceae)

Common name: Eng: Holy Basil, Sacred Basil; Sans: Thulsi; Hind: Thulsi; Tam: Thulasi

Source: Cultivated throughout India ascending up to 2000m in the Himalayas.

Parts used: Whole plant, leaves, roots, seeds.

Active constituents: Bornyl acetate, cadinene, camphene, camphor, carvacrol, β – caryophyllene, eugenol, limonene, methyl chavicol, nerol, α – and β – pinenes, γ – selinene, terpen-4-ol; palmitic acid and stearic acids (oil); ascorbic acid; β-carotene; apigenin and its 7-O-glucuronide, luteolin, molludistin, oreantin; ursolic acid in leaves.

Indications: whole plant: antibacterial, antiperiodic, demulcent, expectorant, insecticidal, mosquito repellant and immunomodulator. Seeds: Demulcent, used in genito - urinary disorders. Leaves: Expectorant, cures dysentery and dyspepsia, chronic fever, haemorrhage.

Method of use & dosage:Root decoction used as diaphoretic in malarial fever. Decoction of fresh leaves is given for common cold and cough. 30-60ml twice a day. [52H]

Research: A steam distilled extract of *Ocimum sanctum* leaves has been shown to enhance anti-sheep red blood cells and IgE antibody titre. Alcoholic extract of *Ocimum sanctum* showed immunomodulatory activity in both non-stressed as well as stressed animals. *Ocimum sanctum* seed oil produced a significant increase in anti – SRBC antibody titre and caused a significant inhibition of antigen induced histamine release from the peritoneal mast cells in non-stressed animals. It also has been reported that hydro alcoholic extract of O. sanctum leaf at 10mg/kg/day produced radioprotective activity in mice against 11GY of Co-60γ irradiation.[57]

10. *Solanum xanthocarpum* (Family: Solanaceae)

Common name:Eng: Yellow berried night shade; Sans: Kanta-karika, Nidegdhika; Hind: Kateli, Bhatkatai; Tam: Kandankathari.

Source: Throughout India, Ceylon, South East Asia, Malaya and tropical Australia.

Description: A prickly diffuse herb, leaves ovate or elliptic sinuate or subpinnatifid glabrescent, with many straight spines.

Parts used: Whole plant, Fruits, seeds, flowers, leaves, stem and root.

Active constituents: β carotene; chlorogenic, isochlorogenic, esculetin, scopoletin, cycloartenol, β-sitosterol, solasodine, solamargine, solanocarpine.

Indications: The root is much esteemed as an expectorant and good immunomodulator. The stems, flowers & fruit are bitter & carminative & are prescribed in those forms of the burning of the feet.

Method of use and dosage: Root decoction in combination with that of *Tinospora cordifolia* useful in cough and fever. A decoction of the root is given with

the addition of long pepper and honey.30-60ml twice a day. [52I]

Research: Methanol extracts of fruits showed immunoprotective activity by increasing the depleted levels of total WBC count, RBC, %Hb, %neutrophils adhesion.[58]

COMPOUND HERBAL PREPARATIONS

1. *Eerulli nei* [59]
2. *Soosika choornam* [59]
3. *Kasakasaa legiyam* [60]
4. *Panchamooligai karpam* [61]
5. *Kumari karpam* [61]

Synergestic Activity of Immunomodulators

Rejuvenation (Anti Ageing)

Rejuvenation is a medical discipline focused on the practical reversal of the aging process.

Rejuvenation is distinct from life extension. Life extension strategies often study the causes of aging and try to oppose those causes in order to slow aging. Rejuvenation is the reversal of aging and thus requires a different strategy, namely repair of the damage that is associated with aging or replacement of damaged tissue with new tissue. Rejuvenation can be a means of life extension, but most life extension strategies do not involve rejuvenation.

For life extension rejuvenating herbs play a vital role. Here is a list of such herbs given in Siddha system of medicine. The list of rejuvenating plants are given below.[10F]

1. *Terminalia chebula*.. Retz
2. *Nervilia aragoana* Gaud.
3. *Tinospora malabarica* Lam.
4. *Azadirachta indica* A.Juss
5. *Solanum trilobatum* Linn.
6. *Indigofera aspalathoides* Vahl ex Dc.
7. *Phyllanthus amarus* Schum&Thonn.
8. *Wedelia chinensis* (Osbeck) Merr.
9. *Plumbago indica* Linn.
10. *Phyllanthus emblica* L.
11. *Evolvulus nummularis* Linn.
12. *Lawsonia inermis* Linn.
13. Hygrophila auriculata Schum& Heine
14. *Achyranthes bidentata* L. Var. rubro-fusca (w) Hooker
15. *Ocimum basilicum* Linn. Var. Purpurascens, Benth
16. *Zingiber officinale* Rosc.
17. *Limonia acidissima* Linn
18. *Eclipta prostrata* L. Mant.
19. *Acalypha indica* Linn.
20. *Glinus lotoides* Linn.
21. *Plumbago auriculata* Linn.
22. *Datura discolor*Bernh.
23. *Abutilon indicum* Linn. S.w.
24. *Datura metel* Linn.
25. *Withania somnifera* Dunal.
26. *Semecarpus anacardium* L.
27. *Bacopa monnieri* L.
28. *Alternanthera sessilis* L.
29. *Piper nigrum* Linn.
30. *Centella asiatica* L.

CONCLUSION

From this review immunology is a rapid developing field of medical research science and technology and to prevent and treat several diseases. Nowadays people affects lot of stress, taking unhealthy food, exposure of toxic substances. This leads to affect our body immune system. Immuno modulation is a normal phenomenon which is act as weak immune system in our body.

The immune system is normally our natural first line of defense against illness and bad health. However, sometimes immune systems function abnormally due to deficiencies and disorders where the body either loses its natural immunity or else the immune system turns against the body it is supposed to protect.

Natural immunomodulators may provide the key to maintaining a strong and proper functioning of the immune system.

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