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Herbal Plants Used for Immunomodulatory Action: A Review

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ABSTRACT

The immune system is one of our most complex biological system in the body. Immunization may be active or passive. The active immunization involves stimulation with an antigen to develop immunological defences against a future exposure and Passive immunization involves administration of preformed antibodies to an individual who is already exposed to be exposed to an antigen. The use of a variety of agents to enhance immunological and nonspecific host defences and thus to modify the favorably is an exciting development in immunopharmacology that is such agents may act by increase the humoral antibody responses, enhancing the phagocytic activity of macrophages or modifying the cell-mediated immune response. Immunomodulatory agents originate from both plant and animal which increases the immune responsiveness of the body against pathogens by activating the non specific immune system. The immune system dysfunction is responsible for various diseases like allergy, asthma, arthritis, cancer and other infectious diseases. So modulation of immune responses to much required to controlling the various infectious diseases. The texts of traditional Indian medicine literature consist of a number of plants reputed to promote physical and mental health, improve defence mechanisms of the body and enhance longevity, lesser number of side effects against synthetic immunomodulatory agent.

KEY WORDS: Immunomodulatory agents, Immunological diseases, Immunostimulants, Immunosuppressant.

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1. IMMUNIZATION:

The immune system is one of our most complex biological systems in the body. The basic role of the immune system is to distinguish self from non-self[1].

Immunization may be active or passive. Active immunization involves stimulation with an antigen to develop immunologic defenses against a future exposure. Passive immunization involves administration of preformed antibodies to an individual who is already exposed or is about to be exposed to an antigen[2].

2. IMMUNOMODULATION THERAPY:

The development of agents that modulate the immune responses rather than suppress it has become an important area of pharmacology. The rationale underlying this approach is that such drug may increase the immune responsiveness of patients who have either selective or generalized immunodeficiency. The major potential uses are in immunodeficiency disorder, chronic infectious disease, and cancer. The AIDS epidemic has greatly increased interest in developing more effective immunomodulating drugs[3].

3. IMMUNOSTIMULANT AND IMMUNOMODULATORS:

The use of a variety of agents to enhance immunological and non specific host defences and thus to modify the defences favorably is an exciting development in immunopharmacology. Such agents may act by:-Increase the humoral antibody responses. Enhancing the phagocytic activity of macrophages, or modifying the cell-mediated immune responses[4].

Drugs like Amantadine and tilorane stimulate the humoral immune system. These are the drug which inhibit cellular/humoral or both immune response and have their major use in organ transplantation and autoimmune disease[5].

4. IMMUNOMODULATORY HERBS:

Several Herbs have potent immunomodulatory action example (*Punica grantum, Baccopa monerae)* etc. They are mention in table no.1

Table 1: List of Plant Having Immunomodulatory Activity:[6-71]

S.N.	Plant Name	Part used	Extract	Model used
1.	*Hibiscusrosa sinensis*	Flowers	Hydro-alcoholic extract	Carbon clearance method, Cellular mediated immunity, Immunostimulatory
2.	*Cleome gynandra*	Aerial parts	Ethanolic extract	Carbon clearance method, Cellular mediated immunity, Immunostimulatory
3.	*Trikatu mega*	Aerial parts	Pe.Ether,Benzene , Choloroform	Carbon clearance assay, delayed hypersensitivity test
4.	*TriAmrit(Terminalia,Allium,Tinospora*)	Aerial parts	Pe.Ether,Benzene , Choloroform,	Carbon clearance assay, delayed hypersensitivity test
5.	*Nyctanthes arbortristis*	Leaf	Ethanolic extract	Humoral immunity, delayed-type hypersensitivity.
6.	*Cissampelos pareira*	Roots	Alkaloidal fraction	Humoral antibody titre
7.	*Bauhinia Vareigata*	Stem bark,	Acetone: water (70:30),	Human Neutrophils
8.	*Human Neutrophils*	Leaf	Methanolic	cellular immunity, humoral immunity
9.	*Tinospora cordifolia*	Stems	Ethanolic extract	DTH, Bone marrow cellularity and α-Esterase cells, Zinc sulphate turbidity test.
10.	*Balanite roxburghi,*	Leaf	Ethanolic extract	Carbon clearance test, serum immunoglobulin
11.	*Ficus carica*	Leaf	Ethanolic extract	Cellular immune response, Humoral antibody response

12.	*Capparis zeylanica*	Leaf	Alcoholic extract	Phagocytosis; Delayed hypersensitivity;
13.	*Trapa bispinosa*	Fruits	Aqueous extract	Neutrophils, Haemagglutination titre.
14.	*Aloe vera*	Leaves	Saline extract	Haematological, Serological studies.
15.	*Heracleum persicum*	Fruits	Aqueous Extract	Haemagglutination titre, Delayed, type hypersensitivity
16.	*Maltese plants*	Aerial parts	Petroleum ether, chloroform, ethanol, 50% aqueousethanol and distilled water	lymphocyte activation, cell proliferation, cytotoxicity.
17.	*Picrorhiza scrophulariiflora*	Whole plant	Aqueous extract	Haemagglutination titre, Delayed type hypersensitivity
18.	*Tinospora cordifolia*	Stem	Alcoholic extract	Immunostimulant, macrophase chemotaxis
19.	*Ocimum sanctum*	Whole plant	Aqueous extract	Enhance the production of RBC, WBC and haemoglobin.
20.	*Bauhinia variegate*	Stem bark	Ethanolic extract	Neutrophil adhesion , Phagocytic activity
21.	*Chlorophytum borivilianum*	Roots	Ethanolic extract	In Vivo Phagocytosis Using Carbon Clearance Method
22.	*Morus alba linn.*	Leaf	Methanolic extract	Humoral immunity, serum immunoglobulin.
23.	*Aesculus indica*	Leaf	Petroleum ether	Neutrophil index, Neutrophil Adhesion
24.	*Ficus benghalensis*	Roots	methanolic extract	Hypersensitivity and hemagglutination reactions
25.	*Citrus*	Fruits	Concentrated	Cell proliferation assay, Immunoblotting

	aurantifolia		juice	
26.	*Cissampelos pareira Linn.*	Roots	methanol extract	Humoral antibody titre, Superoxide , Lipid peroxidation
27.	*Tinospora cordifolia*	Whole plant	Alcoholic extract	macrophage activation; lysozyme;
28.	*Actinidia macrosperma*	Whole plant	Aqueous extract	Immunomodulator, Sarcoma-180 (S180),
29.	*Capparis zeylanica*	Leaf extracts	Aerial parts	Immunomodulatory activity; Phagocytosis; Delayed hypersensitivity;
30.	*Prunella vulgaris*	Fruit-spikes	Aqueous extract	Inhibition of HIV-1 reverse transcriptase activity
31.	*Rhaphidophora korthalsii*	Leaf extracts	Methanolic extract	In vitro splenocyte cytokine (IL-2, IL-12 and IFN-γ)Determinations, In vitro splenocytes, thymocytes and bone marrow cell viability assay
32.	*Selaginella species*	Whole plant	Powdered in gum acacia	Immunomodulatory, short term toxicity
33.	*Couroupita guinensis*	Flowers	Pet. ether, Benzene, Choloroform,,Ethyl acetate, 70% ethanol and water	Allergic reaction, Haemagglutination
34.	*Aesculus indica*	Leaf	Petroleum ether and ethanol	Haemagglutination antibody
35.	*Capparis zeylanica*	Aerial part	Methanolic and aqueous extracts	Heamagglutination antibody titre
36.	*Aloe vera*	Leaves	Powder dissolved in Phosphate buffer solution	Humoral antibody response to SRBC, Cellular immune response (Foot pad reaction test)
37.	*Actinidia macrosperma*	Whole plant	Aqueous extract	AM induced antitumor

38.	*Allium sativum*	Whole plant	Hydro-alcoholic extract	Hemagglutination
39.	*Andographis paniculata*	Whole plant	Andrographolides extract	Delayed type hypersensitivity (DTH) mouse model
40.	*Asparagus racemosus*	Root	Aqueous extract	SRBC sensitized animals
41.	*Baliospermum montanum*	Root	Aqueous extract	Nitroblue tetrazolium test
42.	*Boerhaavia diffusa*	Whole plant	Hydro-alcoholic extract	Circulating antibody titer
43.	*Caesalpinia bonducella*	Seed	Ethanolic extract	Neutrophil adhesion test, haemagglutinating antibody (HA) titre
44.	*Curcuma longa*	Balb	Hydro-alcoholic extract	Humoral antibody response to SRBC
45.	*Eclipta alba*	Whole plant	methanolic extracts	phagocytic index and antibody titer
46.	*Epilobium angustifolium*	Whole plant	Hydro-alcoholic extract	Chemotaxis, NF-kappaB activation
47.	*Mangifera indica*	Stem bark	Alcoholic extract	Humoral antibody response to SRBC
48.	*Picrorhiza kurroa*	Leaf	Ethanolic extract	Cell-mediated and humoral components
49.	*Salicornia herbacea*	Whole plant	Hydro-alcoholic extract	Phagocytic activity on opsonized
50.	*Withania somnifera*	Root	Alcoholic extract	Bone marrow cellularity
51.	*Azadirachta indica*	Leaf	Hydro acetone extract	WST-1-based cytotoxicity assay
52.	*Boswellia carterii*	Bark	Methylene chloride extract	Reagents for lymphocyte transformation assay
53.	*Gymnema*	Leaves	Water extract	Neutrophil locomotion and chemotaxis

	sylvestre			test
54.	*Tridax procumbens*	Aerial part	Alcoholic extract	delayed-type hypersensitivity (DTH) model
55.	*Tinospora cordifolia*	Stem	Alcoholic extract	Bone marrow cellularity and α-Esterase cells, Zinc sulphate turbidity test.
56.	*Clerodendrone Multiflorum*	Stem	Methanolic and ethyl acetate Extract	Invitro Alphaamylase inhibitory activity
57.	*Emblica officinalis*	Fruit	Alcoholic extract	Adjuvant induced arthritic (AIA)rat model
58.	*Heracleum persicum*	Whole plants	Aqueous Extract	Delayed type hypersensitivity; Haemagglutination titre
59.	*Morinda citrifolia*	Fruit	Hydro-alcoholic extract	Protein estimation, Animal-tumour system, Cytotoxicity assays
60.	*Nyctanthes arbor-tristis*	Leaf	Ethanolic extract	Delayed-type hypersensitivity (DTH) reactions, Humoral immune response
61.	*Centella asiatica*	Whole plant	Hydro-alcoholic extract	Human Lymphocyte Proliferation Assay
62.	*Chlorophytum borivilianum*	Root	Ethanolic extract	Azathioprine induced myelosuppresion
63.	*Curculigo orchioides*	Root stocks	Methanolic extract	Haemagglutination antibody (HA) titre and Delayed type hypersensitivity (DTH) response
64.	*Randia dumetorum*	Fruit	Methanolic extract	Cyclophosphamide-induced myelosuppression
65.	*Piper longum*	Fruit	Alcoholic extract	Bone marrow cellularity and esterase positive cells
66.	*Terminalia arjuna*	Bark	Alcoholic extract	Inflammatory, Immunomodulatory and Antinociceptive activity.

5. CONCLUSION:

It can be concluded that studies with new immunomodulatory plants are important for the discovery of drug with less side effects, less costly, more potent and effective treatment developed for immune and their related diseases. This type of study with immunomedicinal herbs will contribute to the benefit of the populations needing herbal treatment to treat immune diseases without being used of synthetic drugs and prevent or reduces the side effect of synthetic drugs.

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