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## **Immunomodulations of Medicinal Plants: A Review**

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### **Abstract**

*Immunomodulators modulate and potentiate the weapons of your immune system keeping them in a highly prepared state for any threat it may encounter. With this balancing effect, all subsequent immune responses improve. Modification of the immune response by pharmacological agents is most effective in therapy is begun before exposure to the antigen has an opportunity to generate a primary response (pretreatment of allograft recipients). A certain autoimmune diseases, such as rheumatoid arthritis, nephritis, uveitis, thyroiditis, and early stages of insulin dependent diabetes mellitus appear to involve response to auto antigen, a potential role for immunosuppressive drug has been recognized. The medicinal plants have a major role to play in curing certain immune diseases.*

**Keywords:** *Immune System, Immunomodulators, Diseases, Pharmacological Plants.*

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### **1. Introduction**

The immune system is a system of biological structures and processes within an organism that protects against disease. Disorders of the immune system can result in autoimmune diseases, inflammatory diseases and cancer and immunodeficiency (Ukpo G. et al., 2013). Immunomodulation is a procedure which can change the immune system of an organism by interfering with its functions; if it results in an enhancement of immune reaction, it is named as an immunostimulative drug which primarily implies stimulation of non-specific system. Immunosuppressant implies mainly to reduce resistance against infections, stress and may occur on account of environmental or chemotherapeutic factors. Immunostimulation and immunosuppression both need to be considered in order to regulate the normal immunological functioning (Kuttan, G. 2000). Herbal drugs are known to possess immunomodulatory properties and generally act by stimulating both specific and nonspecific immunity. Many plants used in traditional medicine have immunomodulating activities. Natural adjuvants, synthetic agents, antibody reagents are used as immunosuppressive and immunostimulative agents. But there are major limitation to the general use of these agents such as increased risk of infection and generalized effect throughout the immune system. Immunosuppression is a major drawback in conventional treatment of cancer such as radiation and chemotherapy. Both these method have sever side effect such as nausea, vomiting, alopecia, mucosal ulceration etc. Modulation of

immune responses to alleviate the diseases has been of interest for many years and the concept of 'Rasayana' in Ayurveda is based on related principles (Wagner, H. et al., 1985).

## 2. Immunomodulatory Effect for Herbal Plants

Immunomodulatory effect of *Ocimum sanctum* and *Valairasa chendhuram* was studied by (Anuradha and Murugesan, 2001) against Copper Acetate induced toxicity on fish *Oreochromis mossambicus*. They found that *O. sanctum* and *Valairasa chendhuram* were efficient in enhancing the immune response and setting back the hematological parameters. The common carp (*Cyprinus carpio*) treated with herbal immunostimulant (*O. basilicum*, *Cinnamomum zeylanicum*, *Juglans regia*, *Mentha piperita*) enhanced bactericidal activity, serum lysozyme, respiratory burst activity, WBC, RBC, hemoglobin, total serum protein, albumin, globulin (Abasali and Mohammed, 2010). Immunoplus (containing *O. sanctum*), a poly herbal formulation mixed diet enhanced the growth of *Labeo rohita* and also it enhanced the total protein and globulin (Kumari et al., 2007). The herbal immuno modulator containing *O. sanctum*, *Phyllanthus emblica*, *Withania somnifera* and Shilajit is very helpful in boosting the immune system and fighting against *Caecal coccidiosis* (Pangasa, 2005). Lymphocyte proliferation of *O. basilicum*, *P. americana*, *P. virginica* and *Rosa spp.*, were studied by (Gomez-Flores et al., 2008). Methanol and aqueous extract of *O. basilicum* showed 80% and 83% of lymphocyte proliferation, respectively. In this present study, lymphocyte count was gradually increased. It is may be due to the presence of flavonoids and terpenoids (Grayer et al., 1996; Lemberkovics et al., 1998). Mediratta et al. (2002) reported that *O. basilicum* modulate both humoral and cell-mediated immune responses. The present study suggests that the aqueous extract of *O. sanctum* stimulate the antibody production in rat. It enhances the production of WBC, RBC and Hemoglobin.

## 3. Immunomodulatory Effects of some Traditional Medicinal Plants

### *Boerhaavia diffusa*

*Boerhaavia diffusa* (Punarnava; Family Nyctaginaceae): It is a creeping weed found abundantly all over India. In Indian traditional medicine, roots of this weed are used for the treatment of dyspepsia, jaundice, enlargement of spleen, abdominal pain and as an anti-stress agent. The hexane extract inhibited significantly of PHA stimulated proliferation of human peripheral blood mononuclear cells at the concentration of 10µg/ml, while chloroform and ethanol extract give this activity at the concentration of 50µg/ml. The suppression by Bd-I and Bd-II is dose dependent and ranged from 63–98% at 500µg/ml to 7–14% at 5µg /ml (Shukla, S. et al., 2009).

### *Allium sativum*

*Allium sativum* (Smith, H. R. et al., 2002): It is an important medicinal plant having immunomodulatory effects. Three proteins showing immunomodulatory were separated from garlic by Q-Sepharose chromatography of 30kD ultrafiltrate of raw garlic extract. All these proteins exhibit the mitogenic activity towards human peripheral blood lymphocytes, murine splenocytes and thymocytes.

## 4. Immunomodulatory Activity of the Methanol Extract of *Amorphophallus campanulatus* Tuber

The majority of people in developing countries still rely on herbal medicines to meet their health needs, especially in cases where synthetic medicines cannot provide relief from hard-to-cure

illnesses. *Amorphophallus campanulatus* (Roxb.) Bl. (Family: Araceae), locally known in India as *Suran*, is a perennial herb with rounded tuberous root stock (corm) that is widely existing in India, Bangladesh, and Africa. The tuberous roots of the plant are used traditionally for the treatment of piles, abdominal pain, tumours, enlargement of the spleen, asthma and rheumatism (Kirtikar, K. R. et al., 1994). The major immunological tests carried out for the assessment of immunomodulation are: Immunomodulation test, Charcol clearance test.

### **Extraction of Plant Material**

The Tuber of *Amorphophallus campanulatus* was cut into small pieces and dried in an oven at 40 – 50 °C. After coarse grinding, it was subjected to maceration in methanol for 5 days, the extract obtained by vacuum evaporation and the yield determined. Phytochemical screening was carried out using conventional methods (Harborne J. B., 1984).

### **Immunomodulatory Tests**

The mice were divided into four groups of six mice each. The mice were immunized with 0.2 ml of 2 %v/v (1×10<sup>6</sup>/ml) sheep RBC (SRBC) for the assessment of delayed-type hypersensitivity (DTH) response and charcoal clearance test. Group I was the control group and was treated with vehicle (Water: Tween 80, 80:20); Group II received 250mg/kg of the extract; Group III received 500mg/kg of the extract; and Group IV received the reference standard (SD), i.e., cyclosporine (5mg/kg).

### **Charcoal Clearance Test**

The animals were administered the extract or standard drug for 15 days. After the last dose, charcoal particle clearance test was performed. Briefly, each mouse was injected with 1:50 diluted Indian ink in a dose of 1mL/100g body weight through its tail vein, and 20µl whole blood was sampled from the *medial canthus* of each mouse at the 2<sup>nd</sup> and 10<sup>th</sup> minute. Two millilitres of 1% Na<sub>2</sub>CO<sub>3</sub> was added to the sampled blood and absorbance was determined at 680nm (Xu et al., 1991). Charcoal clearance index (K) was calculated as in Eq. 1.

$$K = (\lg A_2 - \lg A_{10}) / (t_2 - t_1) \dots\dots\dots (1)$$

Where lgA<sub>2</sub> and lgA<sub>10</sub> are the optical densities at 2 min and 10 min, respectively (Harborne, J. B., 1984).

## **5. Conclusion**

The immune system is complex organ high specialized and sophisticated cells and even circulatory separate from blood vessels. Organ and the tissues of the immune system make the body in a protective network of barrier to infection. Innate and adaptive immunity depends on the activity of white blood cells. There are many natural agents; majorly herbs have the potentiality to defend the antigens, thereby assisting a phenomenon known as immunomodulations. These natural herbs have a copious role in therapy.

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