



Review articles

A study on natural immunity booster plants for human healthArchana Dhyani ^{*1}, Shipra Gupta ¹, Pooja Kala ¹, Nardev Singh ¹, Ashish Dhyani ², Vijay Kumar¹¹Graphic Era Hill University, Dehradun, Uttarakhand, India²Graphic Era Deemed to be University, Dehradun, Uttarakhand, India**ABSTRACT**

The word immunity plays a significant role in today's situation. Due to the pandemic COVID -19, every country and every person is trying to find out the substances or agents that help enhance immunity. In this regard, WHO (World Health Organization) even suggests certain substances or agents enhance an individual's immunity. Nature is the most significant source of providing the substances that help to strengthen the immunity of the body. Immunity is the primary defence mechanism of the body. It provides the capability to the body to fight against infections and diseases. In this manuscript, the information and data are collected about these natural plants which are responsible to increase the immunity in the human beings. The manuscript provides insight into the plants that can be useful in enhancing an individual's immunity. These plants can be cultivated or grown in the garden. The plants can act as an immunomodulator thus it provides the defensive mechanism against infections and diseases. The plants discussed in this manuscript are Neem, Turmeric, Ginger, Aloe Vera, Amla, Tulsi, Garlic, Giloi, Curry Leaves and Tamarind.

Keywords: Immunity, Natural, Therapeutic benefits, WBC and T cells, Extract

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INTRODUCTION

From ancient time, it has found that nature always protects humans from various diseases. Nature gives us the different herbs and plants that will help us to protect the human body against various viral and bacterial infections. In this regard, our immunity provides a primary defensive mechanism to fight against diseases. The plants are the essential aspects which are provided by nature to us. They are responsible for sustaining life on the earth. The plants therapeutic value is due to the active chemical constituents present in it ^[1]. These chemical constituents provide therapeutic benefits in the treatment of any disease. Many plants are available used in the treatment of particular or diseases. Some active pharmaceutical ingredients are obtained from the plants, such as quinine, digoxin, etc., which has medicinal importance ^[2]. Many therapeutic agents like alkaloids, glycosides, lactones, polysaccharides, vitamin C are responsible for immunomodulatory action ^[3].

The medicinal plants are the rich source of Vitamin C Flavonoids and carotenoids, enhancing immunity. The anti-inflammatory action can be shown by the flavonoid's rich plants, e.g., garlic ^[4].

From the last few years, plant-based natural product demand is increased because they are better, safe, and potent as

Immuno modulators. The main advantages of using these herbal medicines as immunomodulators are treating infections and providing better immunity to humans to prevent diseases.

Immunity

Immunity is defined as the body's capability to inhibit the entry of microorganism inside the body, and thus it helps to protect the body against various diseases and organ damage. The immune cells are formed in their bone marrow of the body till they mature there. On maturation, they transfer to the different portions of the body. There are two types of immunity that is humoral immunity and cellular immunity ^[5].

Immunomodulators

These are the agents or substances responsible for stimulation, suppression and modulation of immunity of the immunity.

Classification of Immunomodulators**Immunoadjuvants**

These substances enhance vaccines immunity, and thus these substances acting by strengthening the immune system.

Immuno stimulants

These substances increase the resistance of the body towards infection and thus increases immunity.

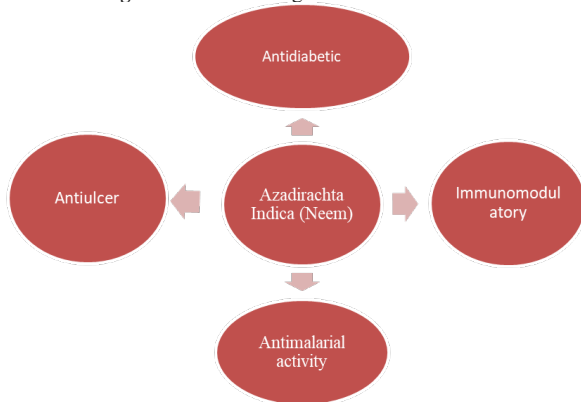
Immuno suppressants

These are the drugs that decrease the body ability to reject a transplanted organ [6-8].

Household plants used to enhance the immunity Neem

The botanical name for Neem is *Azadirachta indica* family Meliaceae. The whole plant is medicinally important. Every part of the neem tree: leaves, roots, barks, flowers, fruits, seeds, was used to treat various diseases and disorders from ancient time. The neem contains different pharmacological properties such as anti-inflammatory, analgesic, immunomodulatory, antiulcer, antioxidant, anticarcinogenic [9].

Figure 1: Pharmacological Activities of Neem



Shah et al., (2009) studied that aqueous extract of Neem flowers causes stimulation of immune responses by stimulation of macrophages and cellular and humoral immune responses. The extract of the plant was examined for induction of cellular responses in murine peritoneal macrophages. The extract shows a rise in phagocytic activity, revealing the body's reticuloendothelial system (RES) [7].

Faal et al., (2012) have studied the immunomodulatory effect of ethanolic and liquefied extract of seed of Neem and *Candida albicans* mannoproteins on mice's immune response to *Brucella Rev-1*. The anti-*Brucella* can be determined by immunofluorescent test. The extract shows the highest immunomodulatory action [8].

Neem's different active constituents include Nimbin, nimbidol, nimbanene, nimbiol, 7-desacetyl-7-benzoylgedunin, imboiled, ascorbic acid, nimbandiol, 6-desacetyl nimbinene, 7-desacetyl-7-benzoylgedunin, Quercetin and β -sitosterol, polyphenolic flavonoids [9-10].

Turmeric

Another important phytomedicine that acts as an immunomodulator is turmeric. The botanical name of Turmeric is *Curcuma longa* family Zingiberaceae. The active constituents of turmeric are curcumin, which inhibits the proliferation of immune cells [11]. The study done by Haque, suggested that curcumin is efficient in treating autoimmune diseases caused by B cells and therefore reduces the chances of malignancies [11]. It also shows immuno stimulatory effects on peripheral blood mononuclear cells

(PBMC). Thus curcuminoids and polysaccharides act as a supplement in the patients suffering from cancers whose immunity was suppressed due to chemotherapies [11]. Srivastava et al. (2011) studied that various *in-vitro* and *in-vivo* studies claimed curcumin's therapeutic potential. Curcumin can inhibit the natural killer cells and other inflammatory pathways. It also has an inhibitory action on cyclooxygenases 1 and cyclooxygenases 2, lipoxygenases, TNF- α , IFN- γ , iNOS and NF- κ B [16]. It was found that curcumin causes modulation of growth and responses of a various cell of the immune system. Curcumin causes proliferation and modulation of T cells. It prevents the proliferation caused by concanavalin A and phytohemagglutinin [12].

Curcumin enhances the proliferation of B lymphocyte-mediated immune function. In some instances, curcumin causes modulation of macrophages. In the case of mice, curcumin causes phagocytosis of peritoneal macrophages and regulation of proliferation of splenocytes [13]. Chandrasekaran 2013 examined the role of aqueous extract of *C. longa* nitric oxide, proliferation, interleukins and macrophages [14]. The result that the extract of *C. longa* is capable of inhibiting PGE2 and IL-12. [15-19]

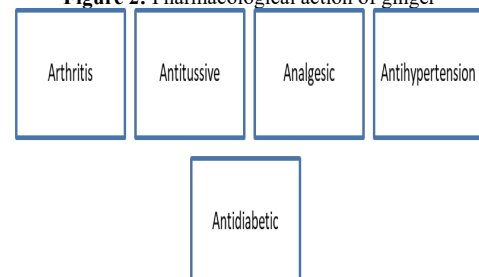
Ginger

Ginger is one of the vital components of Indian herbal medicine. The botanical name of ginger is *Zingiber officinale* Roscoe family Zingiberaceae [20]. In the traditional medicine system, ginger was used to enhance appetite, antitussive, analgesic, anti-inflammatory, antipyretic, and immunoboosters [21]. Ginger can treat various diseases like arthritis, constipation, ulcer, hypertension, vomiting, diabetes. It also has antioxidative properties [22].

The ginger extract consists of active constituents like 6-Gingerols, 6-Shogaols, Zingerol, which can decrease inflammatory mediators like cytokines and chemokines. The effect caused is due to the inhibition of NF- κ B cells cyclooxygenase two reduction and serotonin receptor inhibition [22].

Amri et al., 2016 studied the ginger effect on the protoscoleces (PSC) and cyst wall. At suitable concentration, ginger is effective against the protoscoleces (PSC) and cyst wall. It also shows the anti-hydatic activity and also increases the level of nitric oxide [23].

Figure 2: Pharmacological action of ginger



Aloe -Vera

Aloevera's botanical name is *Aloe Barbadense* miller family Liliaceae. It is one of the most common plants which is

available almost in every home. Aloe vera is rich in vitamins, enzymes, sugars, saponins, amino acids and minerals [24]. Many antioxidants such as α tocopherol, vitamin C, tannic acid, vitamin C and E have found in this plant. These constituents are responsible for the antioxidant property of Aloe vera [25].

It has found that the administration of aloe vera gel is safe and having immune-stimulatory activities. It also has anti-inflammatory properties that's why it is widely used in cosmetic preparations. The whole part of this plant is beneficial in terms of increasing the body immune system. The aloe-vera galvanizes the immune system cells. Aloe-vera enhances the immune system's scavenging activity, which ultimately leads to strengthening the body's immune system. It is a very good immunostimulant due to rhodium and iridium, polysaccharides that increase WBC and T cells [25].

Vahedi et al., 2011 have studied the cellular and humoral immune response in rabbits by using the plant extract of Aloe vera. The result reported that the plant extract causes changes in lymphocytes composition and immunoglobulins [26]. Similar studies were conducted by Chandu et al., 2011. In their research, they found the immunomodulatory activity of leaves of Aloe vera. The study results revealed that the immunostimulatory effect of Aloe vera was due to the presence of alkaloid [27].

Amla

The botanical name of Amla is *Embllica Officinalis* Family: Euphorbiaceae. Amla fruits have various medicinal benefits: laxative, diuretic, astringent, inflammation, cough, and dysentery. Amla is also used as an analgesic, antitussive, cytoprotective, immunomodulatory and antioxidative [28]. *E. officinalis* is used as an immunomodulatory in induced arthritis in the model of rat. It was found that it causes a reduction in anti-inflammatory activity as well as in oedema and causes immunosuppression in rats, which provides a basis that amla can be beneficial in the treatment of arthritis as well [29].

Tulsi

Tulsi is known as the Queen of herbs. It has regarded as the holiest plant as per Hindu mythology. The botanical name of Tulsi is *Ocimum sanctum* family Lamiaceae [30].

Traditionally, Tulsi had used as therapeutics from ancient time. Tulsi was used in Ayurveda, Unani, Siddha, Roman and other medicine systems. Mondal. Investigated that the alcoholic extract of Tulsi is capable of modulation of the immune system [31]. The results showed that the extract of Tulsi causes an increase in the level of interferon- and interleukin-4, T helper cells and NK cells. Thus, Tulsi shows immunomodulatory effects on healthy volunteers [32]. Das et al., 2015 investigate the effect of Tulsi leaf extract on immunity. As per this study, the extract offers protection against the infection caused by hydrophila. The results reveal that the Tulsi has a

remarkable role in enhancing the body's immunity against diseases [33].

Garlic

The botanical name of Garlic is *Allium sativum* Family: Amaryllidaceae. Garlic is most of the widely used plant. It is effective as antimicrobial, anti-inflammatory, anticarcinogenic and cardioprotective. There were various studies conducted on garlic to find its immunomodulatory action and mechanism. The first mechanism which is responsible for its immunomodulatory activity is modulation in the release of cytokines [34].

The second mechanism of garlic immunomodulatory action is the promotion of phagocytosis and activation of macrophages. The oil extract of garlic causes an increase in immunoglobulins production. Further, the presence of components like fructooligosaccharides is responsible for the immunostimulant property of the garlic [35]. Arreola. 2015 studied that garlic extract is useful in treating obesity, cardiovascular diseases, ulcers, and cancers. Garlic is responsible for immunomodulatory and anti-inflammatory properties due to the capability to cause modulation in the level of cytokines and stimulation of immune cells [36].

Giloi

The botanical name of Giloi is *Tinospora cord folia*, family Menispermaceae. This plant has widely used for medicine in the Ayurvedic system. It has various biological benefits like antioxidative, antimicrobial, anti-inflammatory, antistress, antidiabetic, immunomodulatory, analgesic, antianxiety. Arabinogalactan polysaccharide is a compound found in *T. Cord folia*'s stem. The immunomodulatory action of *T. cord folia* may be due to the presence of polysaccharides such as arabinose, fructose and glucose [37].

Curry leaves

Curry leaves botanical name is *Murrayakoenigii*, family Rutaceae. These leaves have used as a spice all over India. The leaves are traditionally used in piles treatment, stomachache, headache, injury, insect bite, vomiting, diarrhea, etc. Various biological properties possess in this plant. These are ant oxidative, anti-tumour, anti-inflammatory and immunomodulatory [38]. Shah studied the effect of methanolic extract of *M Koenigii* on the humoral and cell-mediated immune system. The extracts express the availability of tannins, phenolics and alkaloids. The presence of alkaloids may be responsible for the stimulatory activity of extract on the macrophages. The study suggests that the plants extract has a potential immunomodulatory property that enhances humoral immunity and phagocytosis [39].

Tamarind

Tamarind has a botanical name of *Tamarinds indica* belonging to the family Fabaceae [40]. Every part of Tamarind (root, body, leaves, stem) has medicinal importance. *T indica* is a rich

source of amino acids apart from tryptophan, as per World Health Organization. It also contains phenolics like catenin, mucilage, tartaric acid, glucose, galactose, uronic acid and triterpenes [41].

Tamarind shows various medicinal properties like anti-inflammatory, analgesic, immunomodulatory, hypolipidemic, antioxidant, antidiabetic [42]. Both the leaves and seeds of *Indica* has antioxidant properties the fruit of *T. indicia* is rich in vitamins, polyphenols, mineral content, pectin [42].

Table 1 Natural plants with botanical names and properties

Plant	Botanical name	Family	Active constituents responsible for immunity	Ref
Neem	<i>Azadirachta indica</i>	Meliaceae	nimbin, nimbidin, nimbolide, limonoids, Quercetin and β -sitosterol	[10]
Turmeric	<i>Curcuma longa</i>	Zingiberaceae	curcuminoids	[43]
Ginger	<i>Zingiber officinale Rosaceae</i>	Zingiberaceae	Zingerone, Zerumbone, Gingerol, Paradol	[44]
Aloe - Vera	<i>Aloe Barbadensis miller</i>	Liliaceae	vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids	[45]
Amla	<i>Emblica officinalis</i>	Euphorbiaceae	Tannins, Phenolics, Amino acids, Carbohydrates, Vitamins, Ascorbic acid,	[46]
Tulsi	<i>Ocimum sanctum</i>	Lamiaceae	Oleanolic acid, eugenol, linalool, ursolic acid	[32]
Garlic	<i>Allium sativum</i>	Amaryllidaceae	Alliin, diallyl sulfide, allicin	[47]
Giloi	<i>Tinospora cordifolia</i>	Menispermaceae	Terpenoids, Alkaloids, lignans, Steroids	[38]
Curry leaf	<i>Murraya koenigii</i>	Rutaceae	Mahanimbine, Isomahanine, koenimbine	[39]
Tamarind	<i>Tamarindus indica</i>	Fabaceae	fatty acids, phenolic compounds	[40]

CONCLUSION

From the above discussion, it is concluded that some selected plants have immense potential to cure and protect human beings from various ailments. In that context, nature gifted us different plants which have medicinal values. These plants are easily grown and can be used in day-to-day life. They provide immunity against various pathogens but also prepare the body for fight and flight response. These can be consumed in a daily routine and can be easily grown. These selected plants have importance in day-to-day life, even in this modern lifestyle from ancient time.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest among them.

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