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TAHLAB (SPIRULINA) AND FEW OTHER MEDICINAL PLANTS HAVING ANTI-OXIDANT & IMMUNOMODULATORY PROPERTIES DESCRIBED IN UNANI MEDICINE - A REVIEW

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ABSTRACT: Antioxidants are substances that may protect cells from the damage caused by unstable molecules known as free radicals; free radicals damage may lead to cancer and other diseases. Some of the example of antioxidants are like β-carotene, lycopene, Vit. C, E & A and other substances which are found in variety of fruits, vegetables, algae (spirulina) & other medicinal plants. Spirulina (Blue green algae) is a microscopic single cell alga which grows in fresh water and has a simple structure but a complex composition. It is a concentrated source of food containing nutraceutical, antioxidants, probiotics and phytonutrients. It has been subjected to through screening for its biological role; some of the finding is promising. It has immunostimulant activities. It stimulates the production and activity of bone marrow stem cells, macrophages, T-cells, spleen & thymus gland shows enhanced function. *In-vitro* studies on spirulina indicate that it enhances the cell nuclease activity and DNA repair & hence, it has possible role in cancer treatment. Spirulina has the potential to be accepted by global certification authorities as a safe nutritional and dietary supplement. Some of the plants extensively studied for immunostimulant activity are *Halela*, *Balela*, *Amla*, *Asgandh*, *Satavar*, *Ustakhudoos*, *Gilo*, *Zanjabeel*, *Brahmi* etc. The activation of mononuclear cells to release cytokines and interleukins-I, has been documented for Gilo (*Tinospora cordifolia*), syringing and cordial, the active constituents of this plant, show anticomplimentry and immunomodulatory activity.

INTRODUCTION: Antioxidant properties of spirulina were demonstrated as inhibition of lipid per oxidation by its extract [1].

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Spirulina seems to be one of the best solutions for the simple production of high quality food supplement. Human nutritional and dietary requirement is basic need so optimal provision of the same is of primary importance.

Alteration in lifestyles, dynamic restructuring of micro and macro niches and unavailability of nutrition sources contribute to an increasing incidence of malnutrition and other related health problem.

Nature has been blessed with many "miracle foods" that provide us with incredible amounts of concentrated nutrition and healing and at the same time affordable. Everyone should take miracle foods like spirulina easily found or cultivated throughout the globe for nutrition and healing. Over the past decade, numerous studies have been conducted to evaluate the effect of spirulina supplementation on promoting health & controlling various disorders in humans [2, 3, 4].

Blood lipid-lowering effect of spirulina has been reported in healthy subjects [5], patient with heart disease [6] and diabetic patients [7]. Mice fed spirulina containing diet showed immune-enhancing effect [8, 9], anticancer [10, 11, 12] and hypocholesterolemic effect [13, 14] with health improvement [15]. The agent is gaining attention as a neutraceutical and a source of potential pharmaceutical productS.

Insulin like property is reported in spirulina [16]. Spirulina (Blue green algae/Tahlab) is also used in Unani Medicine for the wound healing, diabetes mellitus, Arthritis, stiffness and in hernia [17, 18, 19, 20, 21, 22, 23, 24, 25, 26]. Current production of spirulina worldwide is estimated to be about 3,000 metric tons. Early interest in a spirulina focused mainly on its rich content of proteins, vitamins, all essential amino acids, minerals and essential fatty acids. Spirulina is 60-70% proteins by weight and contains a rich amount of vitamins, especially vitamin B_{12} and provitamin-A (β-carotene) and minerals especially iron. It has been stated by NASA that the nutritional value of 1000 kg of fruits and vegetables equals one kg of spirulina.

Therefore, in long term Space mission NASA (CELLS) and European Space Agency (MELLISA) proposed that spirulina can serve as a major source of food & nutrition [27, 28]. The United Nations has hailed spirulina as the possible "best food for the future" in its world conference held during 1974. Spirulina can be harvested by simple method & can be processed in to a variety of final forms such as powders, tablets, flakes, syrups etc [29].

In Russia, spirulina has been approved to treat symptoms of radiation sickness, because the carotenoids, it contain absorb radiation [30]. Spirulina has been exhaustively and extensively tested by Scientists around the world and is reported to be powerful and well balanced source of nutrition.

Spirulina has a unique quality to detoxify (neutralize) or to chelate toxic minerals, a characteristic that is not yet confirmed in any other microalgae [31, 32]. Hence, Spirulina can be used to detoxify arsenic from water and food. It may also be used to chelatize or detoxify the poisonous effect of heavy metals from water, food and environment. Beijing University has extracted bioactive molecules from spirulina which could neutralize or detoxify the toxic and poisonous effect of heavy metals and which showed anti-tumor activity. Several institutions in China are focusing on biomolecules which show antitumor, antiaging and antiradiation properties [33, 34]. The basic biochemical composition of spirulina can be summarized as follows:

1. **Protein:** Spirulina contains unusually high amounts of protein between 60-70% by dry weight, depending on the source,[35] from a qualitative point of view, spirulina protein are complete, since all the essential amino acids are present, among these essential amino acids, the most poorly represented are sulphur-containing amino acids methionine and cystine,[36, 37] even so, they are present more than 80 % of ideal level defined by the Food and Agricultural Organization, calculated on the basis of an egg albumin and casein.

   It also appears that one of the drying methods used in industry is drying on hot drums. This spectrum of amino acids shows that the biological value of protein in spirulina is very high and that optimum products could be achieved by supplementation with a good source of sulphur – containing amino acids and possibly lysine and histidine also. As compared to standard protein such as that from meat, eggs or milk, it is however superiors to all standard plant protein such as that from legumes.

2. **Essential Fatty acids**: Human requirements of essential fatty acids are considered to be 1-2% of energy intake for adults and 3% for children [38, 39]. It is now well established that essential lipid intake has an influence on the immune system, both humoral and cellular [40]. Spirulina has a high amount of polyunsaturated fatty acids 1.5-2% as 5-6% of total lipid. In particular spirulina is rich in gamma linolenic acid, linoleic acid, stearidonic acid,

eicosapentaenoic acid, docoschexaenoid acid (DHA) and arechidonic acid. The importance of these fatty acids lie in their biochemical evolution, they are the precursor of the prostaglandins, leukotriens and thromboxanes that serve as chemical mediators of inflammatory and immune reactions. Polysaccharides of spirulina show radio-protective effect [41].

3. **Carbohydrate:** In general carbohydrate constitutes 15-25% of the dry weight of spirulina [42]. Carbohydrate consists of polymer of glucosamine, rhamnosamine, glycogen, glucose, fructose & sucrose. It is worth nothing that spirulina polysaccharides are believed to have a stimulating effect on DNA repair mechanism [43], certain polysaccharides are also thought to have immune stimulating & immune regulating properties [44, 45].

4. **Nucleic acids:** The nucleic acids (DNA & RNA) content is an important nutritional point, because the biochemical degradation part of their components (the purines adenine and guanine) ends by producing uric acid. Total nucleic acid level of 4.2-6% of dry matter have been reported [46].

5. **Vitamins:** Spirulina contains vitamin B_1, B_2, B_3, B_6, B_9, B_{12}, C, D, E & provitamin-A (β-carotene). Beta-carotene accounts for 80% of the carotenoids present in spirulina, the remainder consisting mainly of physoxanthin and cryptoxanthin [47], clinical studies have also shown excellent utilization of spirulina carotenoids in humans [48].

6. **Minerals and trace elements:** the minerals of particular interest are iron, calcium, phosphorus and potassium. The very high iron content should be doubly stressed because iron deficiencies (anemia) are very widespread, particularly in pregnant women and children, and good sources in food are rare. In the case of spirulina, iron bioavailability has been demonstrated both in rats and in humans [49], calcium, phosphorus and magnesium occur in spirulina in quantities comparable to those found in milk.

7. **Experimental studies on few other plants which act as antioxidants & immune-modulator:** There is large number of plant species available in India, most of the plants uses for medicinal purposes in traditional medicine (Unani medicine, Ayurveda etc.). Growing scientific evidence have shown adverse and side effects of synthetic antioxidants, therefore recently there has been an upsurge of interest in natural products as antioxidants & immunomodular activities, that can inhibit the free radical reactions and protect the human body from various diseases like cancer, rheumatoid arthritis, inflammation, obesity etc.

Some of the plants which are used for its antioxidant & immunomodulator activity in Unani medicine and have been validated by pharmacological studies also, are describe as below:

1. **Halela** (*Terminalia chebula*): Family-Combretaceae. Oral administration of ethanol extract of Halela fruits in rats against isoproterenol induced oxidative stress, suggest that the cardio protective effect of *T. chebula* fruits may partly be attributed to its antioxidant properties [50]; alcohol extract of *T. chebula* shows immunomodulatory effect [51].

2. **Balela** (*Terminalia bellerica*): Family-Combretaceae. Acetone extract of fruits of balela contains β-sitosterol, gallic acid, belleric acid & chebulinic acid which shows antioxidant activity [52], inhibitory effect of HIV-I reverse transcriptase, water extract of fruits shows hepatoprotective activity against CCl_4 – induced hepatotoxicity. The ethanolic extract of *T. belerica* produces stimulatory effect on the humoral and cell mediated immune response in the experimental animals due to flavonoids and phytosterols compounds and suggests its therapeutic usefulness in disorder of immunological origin [53].

3. **Amla** (*Embellica officinalis*): Family-Euphorbiacae. The butanolic extract of the water fraction of fruits possess an anti-oxidant property, responsible for cytoprotective action in rats, gastric ulcer induced by indomethacin.

The alcoholic extract of fruits also indicated a significant reduction in the ulcer score and acidity [54, 55], immunomodulator, antioxidant & anticancer activity [56].

4. **Asgandh** (*Withania somnifera*): Family- Solanaceae. *Withania somnifera* possess many pharmacologically and medicinally important chemicals like glycowithanolides, withaferin, they protect the cells from oxidative damage and diseases, good antioxidant, immuno-modulatory, anti-inflammatory, anti-tumor, anticancer properties [57, 58, 59].

5. **Satavar** (*Asparagus racemosus*): Family- Asparagacae. Hydro-alcoholic extract of satavar exhibit antioxidant in rats against CCl_4 induced hepatoxicity [60], *A. racemosus* root extract which contains highest amount of, flavonoids, polyphenols and vitamin-C exhibits antioxidant potential, anti-hyperlipidemic effect & anti-hyperglycemic activity [61].

6. **Ustakhuddus** (*Lavandula stoechas*): Family- Lamiaceae. The flowers' extracts are reputed to possess antibacterial, antifungal and antioxidant properties [62, 63], linalyl acetate (15.26%), linalool (10.68%), 18 cineole (10.25%), γ-terpinene (11.2%) and camphor (11.25%) acts as antioxidant activity [64], flavonoids in *L. stoechas* acts as anti-inflammatory, antioxidant activity in rats [65, 66] and anti-tyrosinase activity [67].

7. **Tulsi** (*Ocimum sanctum*): Family- Labiatae. Antioxidant effects of *O. sanctum* in experimental streptozocin-induced diabetic rats [68], aqueous extract of *O. sanctum* at the oral doses of 100, 200 mg/kg/day in rats enhances the production of RBC, WBC, haemoglobin and also enhanced the production of antibodies without affecting the biochemical parameters [69]. Hepatoprotective activity of *O. sanctum* alcoholic leave's extract against paracetamol-induced liver damage in Albino rats synergism with silymarin and concluded that *O. sanctum* alcoholic leave's extract showed significant hepatoprotective activity andsynergism with silymarin [70].

8. **Gilo** (*Tinospora cordifolia*): Family- Menispermaceae. Dry stem crude extract of *T. cordifolia* contained a polyclonal B cell mitogen, which enhanced immune response in mice[71]. The active component G1-4A enhanced humoral immune response in mice and also protected them against lipopolysaccharide induced endotoxic shock [72, 73]. The extracts from the leaves of *T. cordifolia* exhibited different levels of antioxidant activity in all the models studied [74, 75].

   Antiviral and immunomodulatory effect in HIV patients an antipyretic effect [77].

9. **Zanjabeel** (*Zingeber officinale*): Family- Zingiberaceae. The alcohol extracts of ginger showed an antioxidant and inhibiting effect with regard to the hydroxyl radicals [78, 79, 80]. The immunomodulatory effect of *Z. officinale* essential oils was reported in mice,[81] Antioxidant activity of the zinger is due to the presence of flavones, isoflavones, flavonoids, anthocyanin, coumarin lignans, catechins , Isocatechins; all these act against a variety of free radicals [82].

10. **Brahmi** (*Centella asiatica*): Family- Apiaceae. Brahmi is well known to have a high antioxidant activity [83, 84, 85], triterpenoid, saponins of Centella showed immuno-modulatory effect [86]. Aqueous extract of *C. asiatica* showed significant effect on learning and memory enhancing and significantly decreased the levels of norepineprine, dopamine and 5-HT and their metabolites in the brain [87]. Ethanolic and methanolic extracts of *C. asiatica* had shown significant protection and lowered the blood glucose levels to normal in glucose tolerance test carried out in the alloxan induced diabetic rats [88]. It also exhibit Radio-protective activity [89].

CONCLUSION: Unani System of Medicine always relies upon the use of natural products and has been the source of information for the discovery of many drugs we have today. Currently, increased cost of conventional healthcare has become a driving force in the shift towards interest in alternative medicine for wellness and self-care. In Unani system, a lot of medicines are getting greater recognition among diet and health care professionals.

Spirulina and other medicinal plants discussed above are already in use in Unani medicine since centuries for various health care approaches.

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