Review on: Growing a Glass of Rich Immune Booster at Your Home: 
*Triticum aestivum* L. (Wheat Grass) Beneficial Effect on Health in this Pandemic Scenario

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ABSTRACT
In this review article attention is put towards the common Indian medicinal plant, Wheat grass that has been put into use as a part of Ayurvedic medicine. Wheat grass juice is an effective healer because it contains all mineral known to man and vitamins A, B-Complex, C E and K. It is extremely rich in protein and contains 17 amino acids, the building blocks of protein. It contains enzymes that decomposes superoxide radicals in the body. Wheat grass seems to have positive effects on blood sugar levels. Wheat grass juice seems to increase strength and endure and renew health. Wheat grass juice consumption is seen both in urban and rural diet style. Thus, it is necessary to study and research the relevant medicinal effect of these active components found in young wheat grass on both normal and COVID effected patients to fight the diseases by enhancing the function of immune system to ward off infection and diseases.

**Keywords** - *Triticum aestivum*, Wheat grass, Apigenin, Quercitin, Luteoline.

## I. INTRODUCTION

Wheatgrass is a food prepared from the cotyledons of the common wheat plant (*Triticum aestivum*) belonging to family Gramineae. *Triticum* is a genus of annual and biennial grasses, yielding various types of wheat and is cultivated almost all over the world. Shoot of *Triticum aestivum* called wheatgrass. It is also a powerful health food supplement that is packed with highly concentrated vitamins, minerals, chlorophyll and enzymes. Wheat grass is freshly juiced or dried in powder and used for human consumption. Nutritionally, wheatgrass is a complete food that contains 98 of the 102 earth elements. One of the ingredients with major benefit in wheatgrass is chlorophyll, which has the ability to draw toxins from the body like a magnet. Considered the “blood of plants”, chlorophyll can soothe and heal tissues internally (1). Wheat (*Triticum aestivum* L.) is an important component of the human diet, particularly in developing countries. Epidemiological studies have shown that the consumption of whole grain and whole-grain products are protective against chronic diseases such as cardiovascular disease, diabetes, and cancer (2-5). Wheat germinated over a period of 6-10 days is generally called wheatgrass (6). During germination, vitamins, minerals, and phenolic compounds including flavonoids are synthesized in wheat sprouts, and wheat sprouts reach the maximum antioxidant potential (6). Wheat grass has been shown to possess anti-cancer activity, anti-ulcer activity, antioxidant activity, anti-inflammatory activity, and blood building activity in Thalassemia Major (7,8). Some studies have proved the antioxidant activity of wheat grass juice, when regularly used by the cancer patients the lethal effect on cancer cells has been also found [9,10,11]. Its antioxidant potential which is derived from its high content of bioflavonoids such as apigenin, quercitin, luteoline (7). It contains significant amount of iron, phosphorus, magnesium, manganese, copper and zinc. Wheat grass contains 20 kinds of amino acids and hundreds of different enzymes not found in other foods (12). Wheatgrass contains vitamins C, β-carotene and rich source of tocopherols with high vitamin E potency. The vanillic and ferulic acid contents increase during germination. It also contains chlorophyll that is responsible for the reduction of metabolic activity of carcinogens (13,14,15). There are reports on the antimutagenic effect of oxidative DNA damage towards benzo (a) pyrene induced mutagenicity (16). Falcioni et al. demonstrated the inhibition effect of wheatgrass on oxidative DNA damage (17). Polysaccharides/oligosaccharides of plant or fungal origins are characterized by a wide spectrum of pharmacological effects, including immunomodulation (18, 19) a search based on the Immunologically Active Oligosaccharides Isolated from Wheatgrass Modulate Monocytes via Toll-like Receptor-2 Signaling proved the potentiality and future development of wheatgrass-derived oligosaccharides for use as agents to promote immunity. (20).

## II. PHYSIOLOGY OF THE WHEAT GRASS

Wheat is a widely adapted crop. It is grown from temperate, irrigated to dry and high-rain-fall areas and from warm, humid to dry, cold environments. Undoubtedly, this wide adaptation has been possible due to the complex nature of the plant’s genome, which provides great plasticity to the crop. Wheat is a C3 plant...
and as such it thrives in cool environments.

**Germination to Emergence**

The minimum water content required in the grain for wheat germination is 35 to 45 percent by weight. Germination may occur between 4°C and 37°C, optimal temperature being from 12°C to 25°C. Seed size does not alter germination but affects growth, development and yield. Bigger seeds have several advantages when compared to smaller seeds, such as faster seedling growth, higher number of fertile tillers per plant and higher grain yield (21). The advantage of bigger seeds is demonstrated when the crop is grown under environmental stresses, particularly drought (22).

**Taxonomic Classification**

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<tr>
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<td>CLASS</td>
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<td>SPECIES</td>
<td>Triticum aestivum L. – common wheat</td>
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**III. CHEMICAL COMPOSITION OF WHEAT GRASS**

The name “green blood” of wheatgrass is attributable to its high chlorophyll content which accounts for 70% of its total chemical constituents. Wheatgrass juice is a rich source of Vitamins A, C, E and B complex. It contains a plethora of minerals like calcium, phosphorus, magnesium, alkaline earth metals, potassium, zinc, boron, and molybdenum. The various enzymes responsible for its pharmacological actions are protease, amylase, lipase, cytochrome oxidase, transhydrogenase, super oxide dismutase (SOD). The other notable feature of wheatgrass is its high proportion of amino acids such as aspartic acid, glutamic acid, arginine, ala-nine and serine. The major clinical utility of wheatgrass juice is due to its antioxidant action which is derived from its high content of bioflavonoids like apigenin, quercitin and luteolin. Other compounds present, which make this grass therapeutically effective, is the indole compounds, apigenin and laetrile. (23)

**IV. PHARMACOLOGICAL ACTIVITIES OF PLANT**

i) **Chlorophyll as Green Blood**: The therapeutic effects shown by chlorophyll in conditions involving deficiency of hemoglobin. Can be taken as use of chlorophyll as a blood substitute in conditions like chronic anemia, tissue hypoxia, thalassemia and other hemolytic disorders etc (23).

ii) **Blood Building Activity**: Chlorophyll extracted from the wheatgrass plant or its synthetic derivative chlorophyllin has also been implicated in this clinical condition. The antioxidant mechanism of the various wheatgrass constituents may be responsible for the beneficial effects. The enhanced anti-oxidative capacity of the RBCs may prolong the survival time of not only the newly formed cells, but also of the transfused RBCs. In a clinical study, wherein the thalassemic patients were administered wheatgrass juice on a daily basis, the following conclusions were drawn –

a- 50% patients showed up to 25% reduction in transfusion requirement.
b- The mean time interval between transfusions increased to 29.5%
c- Haemoglobin levels were not compromised by reducing transfusion volumes.
d- The patients reported general well-being, improved appetite and reduced musculo-skeletal aches and pains (23).

iii) **Adjuvant Therapy in Haemolytic anaemia**: It was seen that wheatgrass juice therapy decreased the total volume of blood transfused and increased the intervals between blood transfusions of the entire study cohort. These analyses suggested that not only is this therapy effective, but also that the benefit is related to the duration of the wheatgrass juice therapy. The beneficial effects of this therapy have been attributed to its rich nutritional content that includes antioxidant vitamins (C & E) and bioflavonoids. The effects of the wheatgrass juice therapy may be due to the action of natural antioxidants of red blood cell (RBC) antioxidant function and corresponding effects on cellular enzyme function and membrane integrity. This thought is supported by studies that show decreased antioxidant capacities of RBCs of patients with hemolytic disorders as well as beneficial effects on RBC life-span by supplementation of antioxidants in vivo. The natural antioxidants contained in the wheatgrass juice are better able to avert cellular injury than to repair RBC enzymes/membranes once damaged (23).

iv) **Anticancer Activity**: Wheat grass juice is alternative medicine (CAM) approach of anticancer therapy, due to its high antioxidant content chlorophyll, laetrile and antioxidant enzyme super oxide dismutase (SOD) which converts dangerous free radical reactive oxygen species (ROS) into hydrogen peroxides (having extra oxygen molecule to kill cancer cells) and an oxygen molecule. Another constituent of wheatgrass implicated as an anticancer agent is the plant hormone abscisic acid (ABA). This hormone is 40 times more potent 4 hours after cutting the wheatgrass plant. ABA can neutralize the effect of the hormone chorionic gonadotropin and a compound similar to this hormone has been found to be produced by the cancer cells [24]. Other postulated mechanisms by which wheatgrass juice appears beneficial include antioxidant activity in preventing oxidative damage to deoxyribonucleic acid (DNA) and lipid peroxidation, stimulation of gap junction communication, effects on cell transformation and differentiation.
inhibition of cell proliferation and oncogene (cancer causing gene) expression, effects on immune function and inhibition of endogenous formation of carcinogens. [25] In vitro studies with chlorophyllin on animal model have shown that chlorophyllin is an inhibitor of the cytochrome P-450 liver enzymes [26]. All in vivo (whole animal) studies where cytochrome P-450 enzyme activity is reduced, resulting in lower cancer rates and longer lifespan. [27] Aqueous extracts of wheatgrass are good sources of antioxidants. The clinical studies conducted on human breast cancer have shown that chlorophyllin, a compound that is similar to chlorophyll produced synthetically, has capability to reduce the risk of breast cancer [28]. In another in vitro study it was found that wheat sprout extract inhibited the metabolic activation of carcinogens and decreased their cancer-causing ability by up to 99 percent. [29]

v) Anti-Ulcer Activity: The use of wheat grass (Triticum aestivum) juice is very effective and safe as single or adjuvant treatment of active distal Ulcerative colitis (UC). Green juice and fractions from green juice of young barley leaves containing water soluble proteins and water-soluble organic compounds showed anti-stomach ulcer activity in stressed rats. In another clinical study showed that chlorophyll was found effective in treatment of cyst wounds, fistula-in-ano, sarcoma/carcinoma, ulcerative colitis, thoracic empyema, gunshot wound sinus tracts, decubitus ulcer and burns. Further, it has been observed that in fractures of limbs chlorophyll reduced odour and enhanced healing, in some cases with exceptional results, e.g. legs saved from seemingly inevitable amputation. These clinical studies suggest that chlorophyll may be best agent known for use in the treatment of suppurative diseases, indolent ulcers or wherever stimulation of tissue repair is desired [30, 31]. Which are believed to possess both anti-inflammatory and antioxidant properties as it is rich in bioflavonoid. One of these bioflavonoids, apigenin, has been shown to inhibit tumour necrosis factor induced transactivation [29, 32].

vi) Antioxidant Activity: The antioxidant activity of wheatgrass extract was observed at various levels of protection such as primary and secondary radical scavenging and inhibition of free radical induced membrane damage. It has been shown that these extracts contain significant amounts of phenolic compounds including flavonoids. Wheat sprouts reached the maximum antioxidant potential after 7 days of plant growth. Many of the studies showed that water extracts of wheatgrass are a good source of antioxidants. In view of its antioxidant potential and the ease with which it can be home-grown under known environmental conditions, wheatgrass extracts can be used as a dietary supplement for antioxidant compounds such as polyphenols and flavonoids [23].

vii) Detoxifying Activity: The vitality of liver is of high concern for the overall wellbeing of an individual as it is the major organ implicated in detoxification. In addition to the stimulating and regenerative properties of chlorophyll, other constituents of wheat-grass juice like choline and its high mineral content are responsible for the therapeutic benefit. In a study conducted to observe the effect of choline on liver, it was seen that choline prevents the deposition of fats in the experimental animals’ liver when they were administered a diet rich in cholesteryl [33]. Choline promotes the removal of the esters of both cholesteryl and glycerol, with the effect on the glyceride fraction preceding that on the cholesteryl esters. The lipotropic action of choline is attributed to its in vivo conversion to an active compound which is retained within the hepatic cells and enhances the oxidation of fatty acids and formation of tissue lecithins. The latter effect augments lipoprotein synthesis, which acts as a transport form of fatty acids in plasma and thus helps in removal of lipids from a fatty liver [34]. It has been demonstrated experimentally that the dietary indoles like indole-3-carbinol and ascorbigan increase the activity of phase I and phase II xenobiotic metabolic enzymes in the liver and intestinal mucosa [35]. Thus, the indole compounds of wheatgrass may have a role in the deactivation of carcinogens.

viii) Anti-arthritic Activity: In a study to see the effect of uncooked vegetarian diet rich in lactobacilli, in rheumatoid patients randomized into diet and control groups, it has been observed that and uncooked vegetarian diet, rich in lactobacilli, decreased subjective symptoms of rheumatoid arthritis. The studies indicated that the following group of dietary factors was partially (48%) responsible for the observed decrease in the disease activity index: fermented wheat drink, wheat grass drink, dietary fiber and iron. The studies showed significant response in arthritic patients [36, 37].

ix) Anti-inflammatory Activity: Wheat grass juice exhibit anti-inflammatory, wound healing and odour reducing capabilities. Chlorophyllin has bacteriostatic properties aiding in wound healing, and stimulates the production of haemoglobin and erythrocytes in anaemic animals. It has been used to treat various kinds of skin lesions, burns and ulcers where it acts as a wound healing agent, stimulating granulation tissue and epithelization [23].

x) Tooth Disorders: Wheat is valuable in the prevention and cure of pyorrhea. It takes time to eat wheat and as it is generally taken with other foods, it compels the chewing of other foods also. This not only provides the needed exercise for the teeth and gums but also a great aid to digestion. Wheatgrass juice acts as an excellent mouth wash for sore throats and pyorrhea. It also prevents tooth decay and tooth aches. Therefore, it is beneficial to chew wheat grass which draws out toxins from the gums and thus checks bacterial growth [23].

xi) Skin Diseases: It has been scientifically proved that chlorophyll arrests growth and development of harmful bacteria. Wheat grass therapy can be effectively used for skin diseases and ulcerated wounds as by retarding bacterial action, it promotes cell activity and normal re-
growth by drinking wheatgrass juice regularly, an unfavourable environment is created for bacterial growth [23].

xii) Digestive System Disorders: Wheat grass juice used as an enema helps detoxify the walls of the colon. The general procedure is to give an enema with lukewarm or Neem water. After waiting for 20 minutes, 90 to 120 ml of wheat grass juice enema is given. This should be retained for 15 minutes. This enema is very helpful in disorders of the colon, mucous and ulcerative colitis, chronic constipation and bleeding piles [23].

V. CONCLUSION

In this pandemic scenario when consciousness towards health seems to be increasing among the world population and also seeking instant home remedy and diverting the direction towards the old Vedic derived homemade therapeutic medicine, wheat grass can be a best candidate. Nutrient density due to highly active components such as bioflavonoids like apigenin, quercitin and luteolin, vitamins, high iron, calcium and magnesium, which not only provide cure to various anti-inflammatory, detoxifying activity provide anti-arthritis, anti-ulcer advantages too. It’s being declared that a sound immune system provide better potentiality to fight the COVID-19. It is needed to have active research in this area where wheat grass potency to provide enrich immune booster to fight this health crisis scenario. As growing wheat grass at home is easy and inexpensive can provide a nourishing fuel for body. Easy sprouting methods and growing this green blood for glass full of immunity can be easy way to gain health and get rid of health-related problems also providing a pre-shielded protection to fight this pandemic to a great extent around global.

REFERENCES

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