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Wheat Grass Juice - *Triticum aestivum* Linn' a Therapeutic Tool in Pharmaceutical Research, an Overview

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ABSTRACT

Wheat grass juice is the juice extracted from the pulp of wheat grass and has been used as a general purpose health tonic for several years. Shoot of *Triticum aestivum* Linn. belonging to family Gramineae. *Triticum* is a genus of annual and biennial grasses, yielding various types of wheat, native to southwest Asia and the Mediterranean region. *T. aestivum* Linn, common or Bread wheat is widely cultivated almost all over the world. Generally, 15-20 species are recognized, of which about 8 have been reported to occur in India. It is considered as a cleansing and purifying agent from ancient times and yet can be used for its healing properties because of its nutritional values. Wheat grass is an inexpensive and efficient source to provide all the required nutrients and medicinal benefits for a healthy and rejuvenating body. The leaves contain many chemical compositions such as proteins, flavanoids, alkaloids, glycosides, terpenoides, saponins, fibers, tannins and phenolic compounds. Wheat grass is also rich in chlorophyll. It is commonly known as the "green blood" due to its high chlorophyll content which accounts for 70% of its chemical constituents.



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INTRODUCTION

Wheat grass can be traced back in history over 5000 years, to ancient Egypt and perhaps even early Mesopotamian civilizations. It is purported that ancient Egyptians found sacred the young leafy blades of wheat and prized them for their positive effect on their health and vitality. The consumption of wheatgrass in the Western world began in the 1930s as a result of experiments conducted by Charles F. Schnabel in his attempts to popularize the plant¹. By 1940, cans of Schnabel's powdered grass were on sale in major drug stores throughout the United States and Canada.

Throughout human history, plants have played a key role in treating human diseases. In thousands of years of trials, human found many plants which are good for treating ailments and curing serious health problems like cancer, diabetes, and atherosclerosis. They are a kind of alternative medicine that is inexpensive, and has no side effects. For example: wheatgrass, aloe vera, curcumin, alfalfa, garlic, ginger, German chamomile, grapefruit, green tea. In 2002, the U.S. National Center for Complementary and Alternative Medicine of National Institutes of Health began funding clinical trials about the effectiveness of herbal medicines².

Wheatgrass, has been an integral part of Indian culture for thousands of years, and has been known to have remarkable healing properties. Scientifically known as *Triticum aestivum*, it belongs to Poaceae family. Other plants included in this family are: *Agopyron cristatum*, *Bambusa textilis*, *Cynodon dactylon*, *Poa annua*, *Zea mays*, *Aristida purpurea* etc. There is not much scientific data available on these plants because of a lack of substantial research. Therefore, it is important to study their properties to explore their maximum benefits. Wheatgrass' culms are simple, hollow or pithy, glabrous, and the leaves are approximately 1.2 m tall, flat, narrow, 20-38 cm long and 1.3 cm broad³. The spikes are long, slender, dorsally compressed and somewhat flattened (Figure 1, 2).

Phytochemical constituents of wheatgrass include alkaloids, carbohydrates, saponins, gum and mucilages. Its water soluble extractive value is found to be greater than its alcohol soluble extractive value. This is because of the chlorophyll content of wheatgrass, which is about 70% water soluble³.



Figure 1. Picture of wheat grass



Figure 2. Wheat grass juice

Wheatgrass juice is high in vitamin K, which is a blood clotting agent. People taking blood-thinning medications or people with wheat related allergies shouldn't drink wheat grass juice without consulting a healthcare professional. Wheat allergies are generally a response to the gluten (a protein) found in the wheat berry⁴. The environment in which wheatgrass grows determines its vitality and is thus sown in late autumn for maximum concentration of the active principles. The nutritional vibrancy of wheatgrass is encouraged by supplementing the soil with rich vegetable compost and seaweed. At the onset of the spring season, the simple sugars produced as a result of photosynthesis, undergo conversion into proteins, carbohydrates and fats, with the aid of the various enzymes and minerals absorbed by the plant via its roots. Due to the comparatively lower temperatures in the spring, the grass grows slowly enough for this conversion to occur before the critical jointing stage of growth. At jointing, or the reproductive stage of the plant, the nutrients and energy of the plant are redirected to seed formation. Wheatgrass is harvested just prior to this jointing stage, when the tender shoots are at their peak of nutritional potency⁵.

The major clinical utility of wheatgrass juice is due to its antioxidant action which is derived from its high content of bioflavonoids like apigenin, quercetin and luteolin. Other compounds present, which make this grass therapeutically effective, are the indole compounds, choline and laetrile (amygdalin). In a study conducted to determine the elemental concentration profile of wheatgrass using instrumental neutron activation analysis, it was found that the concentration of

elements such as K, Na, Ca and Mg increased linearly in the shoots with the growth period whereas the concentrations of the elements namely Zn, Mn and Fe remained constant in shoots after 8th day of plant growth for all three conditions of growth. However, it was observed that the shoot to root concentration ratio in all the conditions increased linearly for K, Na, Ca, Mg and Cl and decreased for Zn, Fe, Mn, and Al with growth period⁶.

T.S of wheat grass leaf:

Transverse section of leaflet shows an upper epidermis covered with cuticle. Only covering trichomes emerge from epidermal layer. Dumble shaped types of stomata are seen in the upper epidermis⁷. Mesophyll is made up of uniform parenchyma cells, loosely arranged. Lower epidermis is very similar to upper epidermis. Midrib represents a flat ventral surface and convex dorsal surface. The epidermal layers are continuous over the midrib, collateral and conjoint vascular bundle is prominent occupying the central portion of the midrib. Vascular bundle is surrounded by sclerenchymatous tissues. Diagnostic characters seen in powder drug is dumble shaped stomata along with the epidermal cells, lignified fragments of fibers, unicellular trichomes along with the epidermal cells and oval shaped starch grains. The different constituents of wheatgrass occurring in different proportions are represented in Table 1.



Figure 3 : Dumble shaped stomata in *Triticum aestivum*

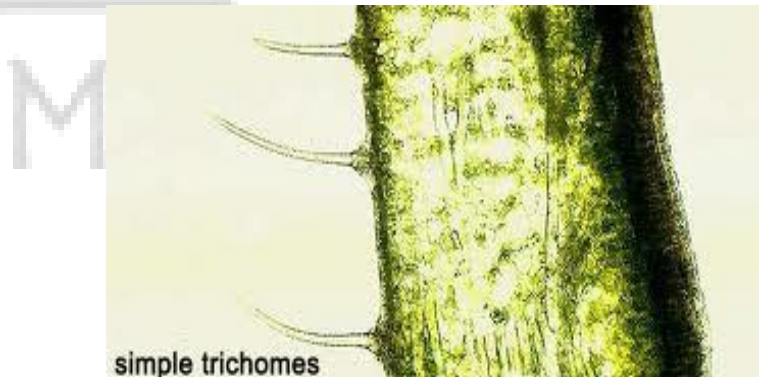


Figure 4 : Simple glandular trichomes in wheat grass

Table 1: Different constituents of wheatgrass occur in the following proportion in the plant

Basic Nutrients	Minerals	Vitamins
Calories: 21.0cal	Iron : 0.61mg	Vitamin C : 3.64 mg
Water: 95 g	Magnesium : 24mg	Vitamin A : 427 mg
Fat:0.06 g	Potassium : 147mg	Vitamin B1 : 0.08 mg
Carbohydrates:2.0 g	Zinc : 0.33mg	Vitamin B2 :0.13 mg
Dietary fiber : < 0.1 g	Calcium : 24.2mg	Vitamin B3 : 0.011mg
Choline : 92.4mg	Selenium : <1ppm	Vitamin B5 : 6.0mg
Glucose :0.80 g	Phosphorous :75.2 mg	Vitamin B6 : 0.2 mg
Chlorophyll : 42.2 mg	Sodium : 10.3 mg	Vitamin B12: < 1 mcg

It is reported that “fifteen pounds of wheat grass is equal in overall nutritional value to 350 pounds of ordinary garden vegetables”⁸ as it contains various essential and nonessential amino acids, vitamins, minerals, chlorophyll and enzymes.

Cultivation of wheat grass juice:

Wheatgrass can be grown indoors or outdoors. A common method for sprout production indoors is often on trays in a growth medium such as a potting mix. Leaves are harvested when they develop a "split" as another leaf emerges. These can then be cut off with scissors and allow a second crop of shoots to form. Sometimes a third cutting is possible, but may be tougher and have less sugars than the first.

Extraction of wheat grass:

Wheat grass juice can be extracted from matured wheat grass leaves, by uniform selected and leaves are cleaned by shade dried. The dried leaves then cut into small pieces and passed into the extractor machine to obtain the wheat grass juice as shown in Figure 5, 6.



Figure 5, 6 : Extracting wheatgrass juice with a manual juicing machines

PHARMACOLOGY OF WHEAT GRASS JUICE:

Pharmacokinetics:

The proteins, lipids and carbohydrates in wheat grass are digested, absorbed and metabolized by normal physiological processes.

Contraindications:

Wheat grass is contraindicated in those who are hypersensitive to any component of a wheat grass containing supplement.

Precautions:

- Pregnant women and nursing mothers should avoid wheat grass containing supplements.
- Wheatgrass supplements may contain high amounts of vitamin K. Those on warfarin should exercise caution in the use of wheat grass supplements.

Adverse reactions:

Wheatgrass juice is safe and the incidence of side effects is very low. It may cause nausea and headache if excessive quantities are taken. Throat swelling may occur in hypersensitive individuals.

THERAPUTIC APPLICATIONS OF WHEAT GRASS

1. Chlorophyll as Green Blood:

Wheatgrass juice is one of the best sources of living chlorophyll available today.

Wheatgrass juice contains up to 70% chlorophyll, which is an important blood builder. The chlorophyll molecules closely resemble that of the heme molecule, the pigment which combines with protein to form hemoglobin. The major difference is the chlorophyll molecule contains magnesium as its central atom, and the heme molecule contains iron. The molecular structure of these two substances is almost identical in all other respects. Chlorophyll contains enzymes and superoxide dismutase, a copper containing protein found in mature red blood cells. This enzyme decomposes superoxide radicals in the body into a more manageable form, thereby helps to reduce the aging process.

Wheatgrass juice contains crude chlorophyll (as opposed to pure) and can be taken orally and as a colon implant without side effects. Science has proven that chlorophyll arrests growth and development of unfriendly bacteria. Chlorophyll is antibacterial and can be used inside and outside the body as a natural healer. Chlorophyll can be extracted from many plants, but wheatgrass is superior because it has been found to have over 100 elements needed by man. If grown in organic soil, it absorbs 92 of the known 115 minerals from the soil.

2. Wheatgrass and skin infections

The bland soothing effect of chlorophyll (wheatgrass) ointments are very beneficial to the treatment of various skin diseases involving the outer and underlying layers of the skin, including: itching and burning of the rectum, weeping and dry eczema and even in conditions caused by insect bites or infection. Liquid chlorophyll washes drug deposits from the body. Chlorophyll neutralizes toxins in the body. Wheatgrass juice cures acne and even helps to remove scars after it has been ingested for seven to eight months. Wheat grass juice is also used for skin problems such as eczema or psoriasis.

3. Wheat grass and Diabetes

Chlorophyll helps purify the liver. Chlorophyll rectifies blood sugar problems. Wheatgrass juice reduces high blood pressure and enhances the capillaries. Incorporation of wheat grass in a diabetic diet may proven to be effective in the management of diabetes mellitus⁹. Hypolipidemic effect of fresh *Triticum Aestivum* grass juice in hypercholesterolemic rats was already reported¹⁰.

4. Wheat grass and cancer

Wheat grass also contains chlorophyll, which was found to be responsible for inhibiting the metabolic activation of carcinogens^{11, 12}. Wheat grass extract is known to contain antioxidant enzymes superoxide dismutase (SOD) and cytochrome oxidase that have the potential to convert reactive oxygen species (ROS) to a hydrogen peroxide and an oxygen molecule. There are reports on the anti mutagenic effect of oxidative DNA damage towards benzo pyrene induced mutagenicity¹³.

5. Wheat grass and tooth infections

A small amount of wheatgrass juice in the human diet helps to prevent tooth decay. Wheatgrass juice held in the mouth for 5 minutes will help eliminate toothaches. It pulls poisons from the gums. Gargle wheatgrass juice for a sore throat.

6. Wheatgrass and Rheumatoid Arthritis

Rheumatoid arthritis affects mainly younger individuals, and is three times more common in females than in males. Early symptoms include redness, swelling, and soreness of joints. Often joints are affected symmetrically, that is both wrists or knees are involved. Pain and stiffness may also travel to other joints and affect the whole body. In later life, lumps and nodules may appear at the joints and lead to deformities. A study showed that when 8.5g of fermented wheatgrass extract (Avemar) taken twice per day with water, in case of 15 Severe Rheumatoid Arthritis patients, showed decreased Ritchie index, and according to a health assessment questionnaire, morning stiffness showed significant improvement. Doses of steroids were reduced in half of patients. This may be due to presence of wheatgrass which contains vitamins A, B1, B2, B3, B5, B6 and B12, vitamin C, E and K, Calcium, Iodine, Selenium, Zinc, and many other minerals, including, superoxide dismutase, muco-polysaccharides, and chlorophyll. Its anti-inflammatory properties exert a positive effect on bone and joint problems, reducing pain and swelling².

The literature review revealed that commonly grown wheat grass can be used for different ailments. It is claimed to reduce hair from graying, improves digestion, reduces high blood pressure as it enhances the capillaries, support the growth of lacto bacilli ¹⁴ and remove heavy

metals from the body^{15,16,17}. Wheat grass juice reduces transfusion requirement in patients with thalassemia¹⁸. It is used in the treatment of active distal ulcerative colitis¹⁹ and also inhibits that is oxidative DNA damage²⁰. Active ingredients extracted from *Triticum aestivum* Linn., showed iron chelating activity.

CONCLUSION

Wheatgrass juice generally contains no harmful substances with the exception of a possible allergic reaction. Wheatgrass is known to minimize fatigue, improve sleep, increase strength, naturally regulate blood pressure and blood sugar, support weight loss, improve digestion and elimination, support healthy skin, teeth, eyes, muscles and joints, improve the function of our heart, lungs and reproductive organs, ulcers and skin sores, slow cellular aging, improve mental function, and is beneficial in arthritis and muscle cramping. It is proven to be beneficial under various conditions, such as anaemia, diabetes, cancer, eczema, constipation, kidney swelling, and common cold. Thus, it should be a part of daily dietary intake in order to explore its maximum benefits.

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