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WHEAT GRASS: A REVIEW ON PHARMACOGNOSY AND PHARMACOLOGICAL ASPECTS

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ABSTRACT

Shoot of *Triticum aestivum* Linn. (Hindi Name- gehun, kanak; Sanskrit name- godhuma) is called as a wheat grass, belonging to family: Gramineae, which posses high chlorophyll content and essential vitamins, minerals, vital enzymes, amino acids, dietary fibers. Wheat grass has been shown to posses anti-cancer activity, anti-ulcer activity, antioxidant activity, anti-arthritic activity, and blood building activity in thalasemia. It has been argued that wheat grass helps blood flow, digestion and general detoxification of the body. Wheatgrass has been traditionally used, since ancient times, to treat various diseases and disorders. Presently, there are a number of wheat grass suppliers, in almost all cities of India, supply fresh wheatgrass, on daily basis to their regular customers by home-delivery system for various ailments and as health tonic.

Keywords: Wheat grass, Graminae, Antiulcer, Anticancer.

INTRODUCTION

Wheat (*Triticum aestivum* L.) belonging to the family *Gramineae* 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. Wheat germinated over a period of 6-10 days is generally called wheatgrass. During germination, vitamins, minerals, and phenolic compounds including flavonoids are synthesized in wheat sprouts, and wheat sprouts reach the maximum antioxidant potential (Aydos *et al*., 2011). Wheat Grass refers to the young grass of the common wheat plant, Triticum aestivum that is freshly juiced or dried into powder for animal and human consumption. Both provide chlorophyll, amino acids, minerals, vitamins, and enzymes. Wheat grass is a humble weed that is a powerhouse of nutrients and vitamins for the human body.

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In the form of fresh juice, it has high concentrations of chlorophyll, active enzymes, vitamins and other nutrients. Wheatgrass is the young grass shoots of the wheat berry. It is considered to be a complete food because it contains every amino acid, vitamin, and mineral (some in only trace amounts) necessary for human nutrition.

Wheatgrass juice is immediately absorbed into the bloodstream and gives immediate energy. Wheat grass juice is the richest source of vitamins A, B, C, E and K, calcium, potassium, iron, magnesium, sodium, sulphur and 17 forms of amino acids.(Mujoriya *et al*., 2011)

The following advantages show that juicing wheatgrass is very beneficial.

1. Wheatgrass energizes and reduces fatigue.
2. It is an appetite suppressant.
3. Wheatgrass juice improves metabolism.
4. It improves digestion.
5. Wheatgrass juice enriches the blood, removes blood disorders, & lowers blood pressure
6. Wheatgrass juice is antibacterial and helps cleanse the liver

Classification of *Tritium aestivum*
Kingdom : Plantae
Division : Magnoliophyta
Class : Liliopsida
Order : Cyperales
Family : Gramineae
Genus : *Triticum*
Species : *aestivum*

Chemical Constituents

Wheatgrass is a vegetable, harvested prior to the plant forming the flower head. Wheatgrass packs a nutritional punch, including (per 3.5 grams) 860 mg protein, 18.5 mg chlorophyll, 15 mg calcium, 38 mg lysine, 7.5 mg vitamin C and an abundance of micronutrients, such as B complex vitamins and amino acids. 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 soluble.

Wheat grass 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 health care professional. Wheat allergies are generally a response to the gluten (a protein) found in the wheat berry (Rana *et al.*, 2011).

A. Wheat grass contains Vitamin A: It improves the skin luster and provides glow to the outer skin and makes it disease free. It helps in treatment of black spots and blemishes below the eyes and increase the eyesight. It is also helpful in checking the eyes, nose, and throat disorders.

B. wheatgrass contain Vitamin B: It helps in digestion. It is useful in the treatment of digestive disorders, mental, depression, insomnia, premature aging and anorexia.

C. Wheatgrass contain Vitamin C: Vitamin C is involved with citrus fruits, such as lemons, limes and oranges. However, wheatgrass contains more vitamin C as compareto orange. A powerful antioxidant, vitamin C is helpful for recovering from sickness (including the common cold) and preventing disease (such as scurvy it is a essential substance for healthy gums and teeth and improving the bones.

D. Wheargrass contain Vitamin E: It dilates the capillaries and enables free flow of the blood. It is useful for the women during pregnancy, it reduce abortion and it is a useful substance in the treatment of sexual impotency, diabetes, cancer, heart disorders and dysmenorrheal etc

E. Wheatgrass contain Vitamin K and B-complex vitamins- Wheatgrass involves a number of other vital vitamins. It's rich in vitamin E, vitamin K and B-complex vitamins. Wheatgrass is also acts as source of vitamin B-17, also known as amygdalinex

F. Wheatgrass contain MSM -

MSM is a sulfur containg molecule found in all living organisms destroyed in processed food. It helps our body use vitamins, helps to prevent from allergies.

G. Wheatgrass contain Proteins and Amino acids: Proteins are important for muscular strength and physical elegance. Plasmas, hormones and antibodies are derived through proteins. Amino acid helps in digestion, blood formation and provides potency to the heart.

H. Wheatgrass contain Enzymes: Enzymes are the digestive elements. The substances in the Wheat grass juice are useful for dyspepsia.

I. Wheatgrass contain Minerals

Iron: Iron is vital element for life. Iron cause creates shortage of hemoglobin in blood. It is useful in pregnancy, for excessive sweating, pale complexion, laziness and lethargy, and insomnia.

Wheatgrass contain Calcium: Calcium is the prime instigator for essential activity. It strengthens the bones It is useful in treatment of the diseases like hemorrhage, distension of body, slow movements, coldness and varicose veins etc

Wheatgrass contain Zinc: Helpful in the prostate gland disorders and nourishes hair.

Wheatgrass contain Sodium: Sodium regulates the extra cellular fluid volume. It also maintains the acid-base equilibrium and regulate proper water balance in the body. (Majoriya *et al*., 2011).

Biological Activities
Antioxidant activity

The antioxidant activity of wheatgrass, which is used as a dietary supplement, was estimated at different levels. Aqueous and ethanol extracts of wheatgrass are grown under different conditions over a period of 6, 7, 8, 10 and 15 days were used. Different conditions are involved in growth (1) tap water, (2) tap water with nutrients, (3) soil and tap water, and (4) soil with nutrients. For comparison, a commercially available wheatgrass tablet was analysed. Wheat grass has antioxidant enzyme super oxide dismutase (SOD) which converts free radical reactive oxygen species (ROS) to hydrogen peroxides (having extra oxygen molecule to kill cancer cells) and an oxygen molecule (Kulkarni *et al*., 2006).

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, reduced 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 (Nenonen *et al*., 1998).

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 it has high mineral content that is responsible for the therapeutic benefit. In a study conducted to see the effect of choline on liver, it has been observed that choline prevents the deposition of fats in the experimental animals' liver when they were administered a diet rich in cholesterol (Nenonen *et al*., 1933).

Anti-inflammatory activity

Wheat grass juice has anti-inflammatory, wound healing and odour reducing capabilities. Chlorophyll has bacteriostatic properties aiding in wound healing, and stimulates the production of hemoglobin and erythrocytes in anaemic animals. It has been used to cure various kinds of skin lesions, burns and ulcers where it acts as a wound healing agent, stimulating granulation tissue and epithelization (Gahan *et al.*, 1943).

Anti-ulcer activity

In a randomized, double-blind, placebo-controlled study on WGJ observed that the use of wheat grass (*Triticumaestivum*) juice is very effective and safe as asingle for treatment of Ulcerative colitis (UC). Green juice of young barley leaves have water soluble proteins and water soluble organic compounds showed anti-stomach ulcer activity in stressed rats (Singh *et al*., 2012).

Anticancer activity

Wheat grass juice helped to improve the health status and lifespan in terminally ill cancer patients. The extract of wheat grass when applied to known chemical mutagens, reduced their cancer causing abilit by up to 99 percent (Lai *et al*., 1978). This suggests that wheat grass has cancer preventing property. The clinical studies are applied on human breast cancer have shown that chlorophyllin, a compound that is resemble to chlorophyll produced synthetically, has capability to decresed the risk of breast cancer (Chiu *et al*., 2005).

A supernatant extract that is obtained from wheat grass has been shown to reduce the production of carcinogenic, aromatic hydrocarbon (Benzopyerene) derivative, to prevent benzopyerene mutagenecity with non chlorophyll containing Wheat sprout extract which suggests that chlorophyll is not the main compound responsible for anticancer activity (Peryty *et al*., 1992).

Biological activity of wheat grass based on DNA technology

Wheatgrass extract for fetal hemoglobin induction on three separate human cell clones and reported that over a 5 day period:"Our measurements suggest a 3-5 fold increase in the production of HbF by the wheat grass extract. This is a substantial increase and could certainly provide an explanation why some thalassaemia patients may derive significant benefit (Reynold *et al*., 2005).

Apoptitic activity

Apoptotic eff ect of wheatgrass ethanol extract on K562 cells was 1.6 and 2.4 times higher than that of the controls at 24 h and 48 h, respectively (Figur) and apoptotic eff ect of wheatgrass aqueous extract on K562 cells was 4.3 and 4.6 times higher than that of the controls at 24 h and 48 h (Figure 2), respectively. Although there were no signifi cant diff erences between apoptotic eff ects of aqueous and ethanol extracts of wheatgrass, the highest apoptotic eff ect was observed on K562 cells treated with aqueous extract of wheatgrass at 48 hrs(Aydos *et al*., 2011).

Antihyperlipidemic activity of wheatgrass

Phospholipids are the major constituents of the biomembrane and are the primary targets of peroxidation process and they are altered by ethanol consumption. In our study we found a decrease in the levels of phospholipids in liver, which could be due to increased enzymatic degradation, which modify the composition, structure and stability of the biomembranes thus leading to liver dysfunctioning.

Induction of CYP2E1 by ethanol is the central pathway for the generation free radicals. Together with excess PUFA in diet, it causes oxidative damage to cellular membranes and decreases the membrane phospholipids. Wheatgrass by the virtue of its effective antioxidant property decreased the membrane damage and could have preserved the levels of phospholipids (Durairaj *et al*., 2014).

Chelating activity

The wheat grass extracts quenches the formation of ferrozine –Fe2+ complex. The protective effects of wheat grass towards the erythrocyte membranes can be attributed to their iron chelating capacities, since they can extract iron ions and hinder radical reactions. Moreover, the phenolic and flavonoid compounds can scavenge free hydroxyl and peroxy radicals and protect the membranes. The phenolic compounds stabilize the erythrocyte

membrane by interaction with the membrane phospholipids (Malla *et al*., 2014).

Tradional Uses

Wheatgrass has been traditionally used, since ancient times, to treat various diseases and disorder. Wheatgrass is a safe and effective treatment for ailments such as high blood pressure, some cancers, obesity, diabetes, gastritis, ulcers, anemia, asthma and Eczema. (Shah *et al*., 2011). Wheat flour is used to prepare bread, produce biscuits, confectionary products, noodles and vital wheat gluten or seitan. Wheat is also used as animal feed, for ethanol production, brewing of wheat beer, wheat based raw material for cosmetics, wheat protein in meat substitutes and to make wheat straw composites. Wheat germ and wheat bran can be a good source of dietary fiber helping in the prevention and treatment of some digestive disorders. (Kumar *et al.*, 2011).

Medicinal Uses

Wheat grass is used for swelling on the joints, pain in the joints, osteoarthritis, bone rotting. The ability of wheatgrass in the maitainence of bone and joint diseses is due to its strong anti-inflammatory effect. It can significantly assist to lower pain, swelling and inflammation, and stop subcutaneous and cutaneous bleeding rapidly, therefore increasing the natural healing process.

In osteoarthritis

Patients quikly report warmth in and nearby the joint within a short period of time after application. Normally this is followed by enhanced movement of the joint i.e. within 10 to 20 minutes..

Fractures

If fracture, apply quickly to suspected fracture area before splinting. Apply nearby the wound if skin broken. If plaster already applied, smear WG over skin at both ends of plaster 3 times a day. It can effect in marked reduction in swelling, bruising & pain & fastens healing.

Gout, acute & acute on chronic

Apply every 3 or 4 hours. Maintain hyperuricemic therapy. it can provide anti-inflammatory effect to hyperuricemics & prevents attack. Continue daily application to help protection of further attacks

Skin diseases

As the wheat grass juice is an active blood purifying agent, it is very efficacious in the treatment of skin diseases. It has been found to be useful in the treatment of eczema, acne (pimples), boils, cuts and wounds, bites and burns, Gangrene , skin itching .

Reduce Eczema Symptoms

Wheatgrass juice is a fantastic choice for a drink as it useful in blood purification. Drinking wheatgrass on a regular basis will also maintain a normal blood pressure. Therefore, wheatgrass is said to be able to "cure" blood disorders of all types. Wheatgrass Is also known to give the essential enzymes that the body needs for good health. Enzymes, in turn, are very useful in strengthening the body's immune system and in the fight against eczema.

Kidney related diseases

Included in the section are the problem of stone, inflammation of the urinary bladder, and inflammation of other kidneys. Along with the wheat grass juice if water treated with magnets is also taken the results are better and the treatment is rapid.

Ear diseases

In reducing ear pain and treating the problem of septic release from the ear wheat grass juice has shown very good effects. In addition having the wheat grass orally, some juice should be dropped in the ears to treat ear diseases.

Figure 1. Wheat grass

Figure 2. Vitamin A

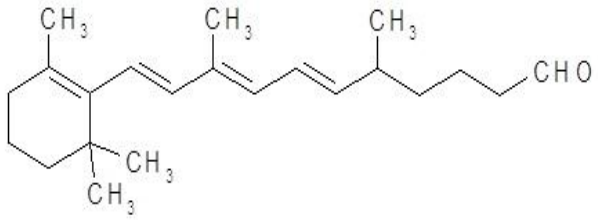

Figure 3. Chlorophyll-*a* ($C_{55}H_{72}MgN_4O_5$, mol. wt.: 893.49). The methyl group marked with an asterisk is replaced by an aldehyde in chlorophyll-*b* ($C_{55}H_{70}MgN_4O_6$, mol. wt.: 906.51).

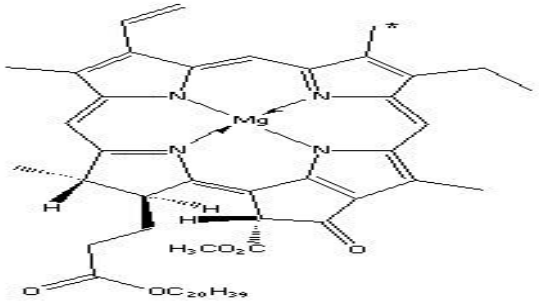

Figure 4. Normal liver Alcohol, PUFA Liver showing normal histology with Mild portal inflammation and microvesicular Control vein fatty changes

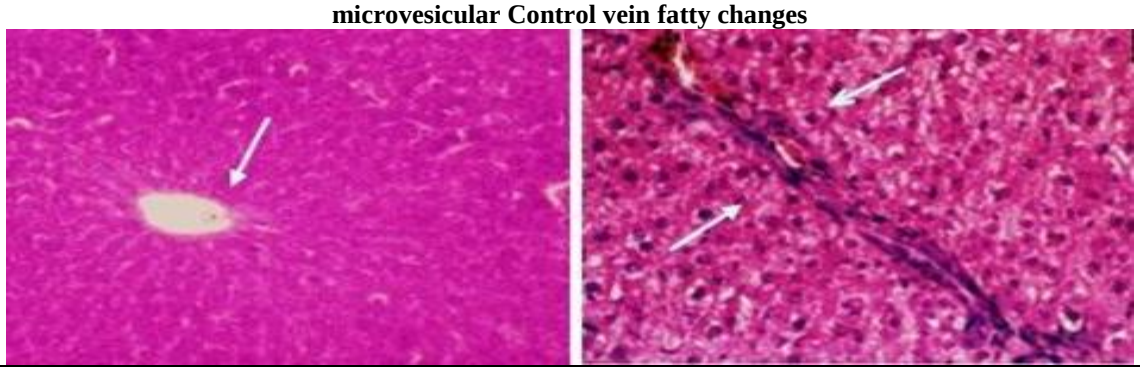

Figure 5. Alcohol PUFA, Wheatgrass liver Fatty changes and inflammatory cell liver showing normal histology with portal trail Infiltration around central vein

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