Integrated Management of Crop Diseases

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FUNCTIONAL BEVERAGES OF WHEATGRASS JUICE: BROAD SPECTRUM APPLICATION IN THE TREATMENT OF VARIOUS DISEASES

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INTRODUCTION

Functional beverage is the quickest developing section in the functional food category (Gruenwald, 2009). In Thailand, functional drink market grew from Bt1.8 billion in 2009 to Bt6.6 billion in 2014 (Ketnil, 2014). The record predicts the world purposeful beverage market to develop with a CAGR of 6.3% over the forecast period of 2018-2024. The study conducted on functional beverage market covers the evaluation of the leading geographies such as North America, Europe, Asia-Pacific and RoW from the period of 2016 to 2024. The consumer interest in natural functional drinks, with anti-aging, Energy supplying, relaxing, or beauty enhancing effects is increasing. To avoid intake of chemical substances, natural substances from plant, which are favored than animal sources, have been an increasing number of used as functional phyto-components in beverages.

The cereal grasses (young leaves of grain-bearing plants), which include wheat, barley, alfalfa, rye, oat, and kamut, are interesting ingredients

for functional drinks. They comprise huge concentrations of phytochemicals and vitamins (Gruenwald, 2009). Especially wheatgrass juice, received from younger wheat plant was once first used for promoting human fitness by Ann Wigmore, founder of the Hippocrates Health Institute in Boston (Wigmore, 1985). It is frequently known as the "green blood" due to its high chlorophyll content material (Padalia *et al.*, 2010). Chlorophyll bears structural similarity to hemoglobin and has been discovered to regenerate or act as a substitution for hemoglobin in hemoglobin deficiency conditions. This may be the reason in the back of the utility of wheatgrass in medical conditions like thalassemia and hemolytic anemia (Padalia *et al.*, 2010; Marawaha *et al.*, 2004). In addition, chlorophyll collectively contains essential enzymes like superoxide dismutase, the plant hormone Abscisic acid or dormin, and its alkalinity play their roles in the anticancer properties (Padalia *et al.*, 2010).

Antioxidants content in wheatgrass juice such as (pro) nutritional vitamins C, E, beta-carotene and zinc are accountable for anti-allergic and anti-asthmatic treatment, while bioflavonoids account for many medical utilities such as management of inflammatory bowel disorder and as a general detoxifier. Wheatgrass juice is protected and the incidence of facet outcomes is very low.

In case of barley grass, there is a document on the contents of diet, complete polyphenols, ferulic acid, monosaccharides and amino acids indicating that it is a precious plant fabric (Paulíèková *et al.*, 2007). In this present proceeding we are trying to assess the value of wheatgrass therapeutically in various ailments and may help researcher to step forward to explore more potential unidentified bioactive of this grass.

Chemical composition of wheatgrass:

- 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.
- Pharmacological actions are protease, amylase, lipase, cytochrome oxidase, transhydrogenase, super oxide dismutase (SOD).
- High content of bioflavonoids like apigenin, quercitin and luteolin and other therapeutically active are indole compounds and laetrile.

Mode of action of constituent in wheatgrass juice

Quercitin, an important bioflavonoids constituent of wheatgrass juice which initiate apoptosis via the mitochondrial pathway which involves

the activation of caspase-3 and caspase-9 followed by the release of cytochrome c (Cyt c) and cleavage of poly-ADP-ribose polymerase (PARP). This action of inhibiting tumor progression is reported in a variety of human cell lines, including breast cancer MCF-7 cells, nasopharyngeal carcinoma CNE2 and HK1 cells, leukemia HL-60 cells, thymus-derived HPBALL, and oral squamous carcinoma SCC-9 cells (Lautraite *et al.*, 2002; Haghiac *et al.*, 2005; Russo *et al.*, 2014). It also inhibits the oxidative harm to DNA molecule of cells.

Antiangioactivity: - Angiogenesis, characterized by the formation of incipient vessels from a presubsisting microvascular network, is a crucial step in the magnification and metastasis of cancer and replenishes the growing tumor cells with oxygen and nutrients (Tuli *et al.*, 2014 ; Tuli *et al.*, 2015). This flavonol was found to inhibit several steps of angiogenesis including proliferation, migration, and tube formation of human microvascular dermal endothelial cells in a dose-dependent manner (Chien *et al.*, 2009). A decrease in the expression and activity of MMP-2 and MMP-9 was additionally observed in a variety of cancer cell lines. In the other hand, Luteolin activates JNK, which inhibits TNF-á mediated NF-kB translocation, promoting TNF-á induced apoptosis in cancer cells. However luteolin can mediate autophagy as cell death mechanism by triggering intracellular acidic lysosomal vacuolization and accumulation of microtubule-associated LC3II protein, which in turn enhances autophagy flux.

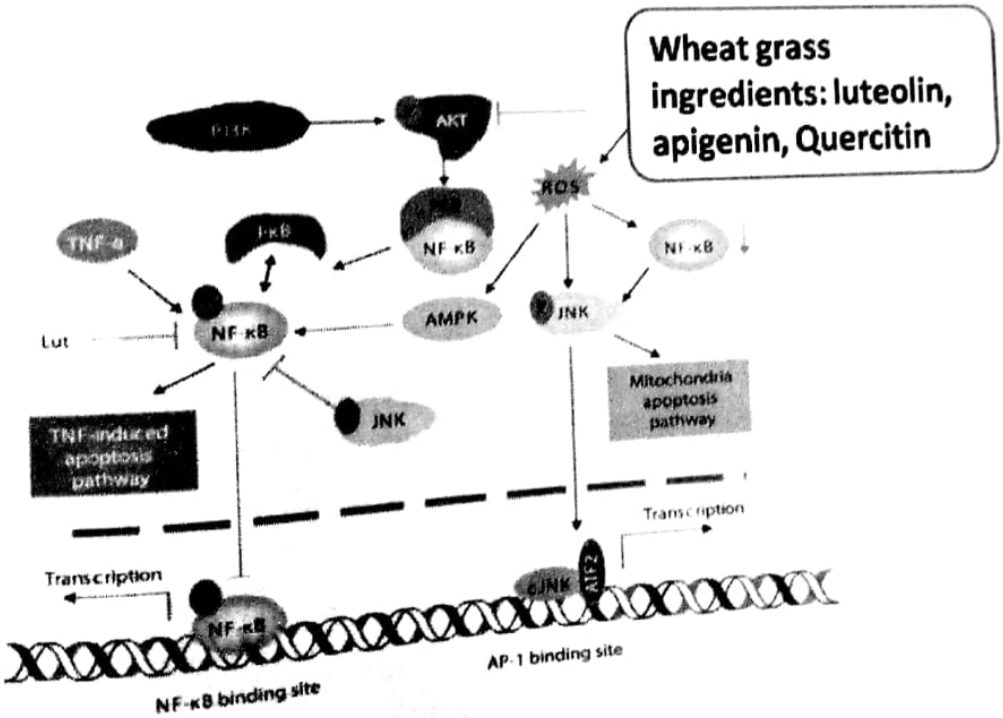

Fig: Expected mechanism of wheatgrass action in cancer

Therapeutic activity of wheatgrass juice:

A. Blood building exercise in Thalassemia major: - Beta-thalassemia is a genetically inherited disease that arises due to peculiar beta globin chains which are required for the synthesis of grownup hemoglobin (HbA). Individuals with thalassemia might also continue to produce gamma globin chains in an effort to enlarge the amount of fetal hemoglobin (HbF) and compensate for the deficiency of HbA. 3-5 fold amplifies in the production of HbF on consumption of wheatgrass has been documented with the use of a cellular assay (Fibach *et al.*, 1993).

This has now been confirmed via the development of a unique assay approach for HbF, which is based on detecting its production in human erythroleukemia cells the usage of a fluorescent protein gene that replaces the genes for HbF (Reynolds, 2005). The superior anti-oxidative ability of the RBCs can also extend the survival time of now not only the newly formed cells, however additionally of the transfused RBC's (Fernandes *et al.*, 2005).

B. Anticancer activity of wheatgrass juice:- Excessive antioxidant content material chlorophyll, laetrile and antioxidant enzyme super oxide dismutase (SOD) which converts unsafe free radical reactive oxygen species (ROS) into hydrogen peroxides (having greater oxygen molecule to kill cancer cells) and an oxygen molecule (Mates *et al.*, 2000). Another constituent of wheatgrass associated as an anticancer agent is the plant hormone abscisic acid (ABA).

This hormone is forty fold more potent 4 hours after cutting the wheatgrass plant. ABA can neutralize the effect of the hormone chorionic Gonadotropin and a compound comparable to this hormone has been discovered to be produced through the most cancers cells (Livingston. 1976). Other postulated mechanisms by using which wheatgrass juice seems beneficial include antioxidant activity in preventing oxidative harm to deoxyribonucleic acid (DNA) and lipid peroxidation, stimulation of gap junction communication, consequences on cell transformation and differentiation, inhibition of cells proliferation and oncogene (cancer causing gene) expression, outcomes on immune feature and inhibition of endogenous formation of carcinogens. (Wheat *et al.*, 2008).

The clinical studies performed on human breast cancers cells have proven that chlorophyllin, a compound similar to chlorophyll produced synthetically, has functionality to reduce the probability of breast cancer (Chiu *et al.*, 2005).

C. Adjuvant therapy in haemolytic anemia: - The effects of the wheatgrass juice therapy may additionally be due to the action of herbal antioxidants of red blood cell (RBC) antioxidant characteristic and corresponding outcomes on cellular enzyme function and membrane integrity. This thought is supported by means of studies that show lowered antioxidant capacities of RBCs of sufferers with hemolytic problems as nicely as recommended effects on RBC life-span via supplementation of antioxidants in vivo (Shyam *et al.*, 2007). It may additionally suggest that the natural antioxidants contained in the wheatgrass juice are better capable to avert cellular harm than to restore RBC enzymes/membranes once damaged. Therefore, wheatgrass juice and other dietary remedies may additionally be viewed as an adjuvant to drug therapy.

D. Anti-ulcer activity Wheat grass: In a randomized, double-blind, placebo-controlled learn about on WGJ (Ben-Arye *et al.*, 2002) observed that the use of wheat grass (Triticumaestivum) juice is very superb and secure as a single or adjuvant treatment of lively distal Ulcerative colitis (UC). Clinical research endorse that chlorophyll may be high-quality agent known for use in the therapy of supportive diseases, indolent ulcers or at any place stimulation of tissue repair is favored (Bowers, 1947; Singh *et al.*, 2012). Which are believed to possess each anti-inflammatory and antioxidant residences as it is prosperous in bioflavonoid. One of this bioflavonoid, apigenin, has been shown to inhibit tumour necrosis issue triggered transactivation (Ben-Arye *et al.*, 2002; Shah, 2007).

E. Anti-arthritic activity of wheat grass:- In a study conducted to see the impact of raw vegetarian diet enriched with lactobacilli, in rheumatoid patients randomized into weight-reduction plan and manipulate groups, it has been discovered that and raw vegetarian diet, riched in lactobacilli, decreased subjective signs of rheumatoid arthritis. The research indicated that the following crew of dietary elements used to be in part (48%) accountable for the found minimize in the diseases activity index: fermented wheat drink, wheat grass drink, dietary fiber and iron. The research confirmed considerable response in arthritic sufferers (Nenonen *et al.*, 1998; Kumar *et al.*, 2011).

F. Digestive System Disorders: Wheat grass juice used as an enema helps detoxify the walls of the colon. This enema is very beneficial in disorders of the colon, mucous and ulcerative colitis, persistent constipation and bleeding piles (Hvatum *et al.*, 2006).

Conclusion

Widespread information from a range of studies has made recognised the multitude results of Wheatgrass juice is recognized to help cut back fatigue, enhance sleep, expand strength, naturally regulate blood strain and blood sugar, support weight loss, enhance digestion and elimination, assist wholesome skin, eyes, muscles and joints, improve the characteristic of our heart-lungs and reproductive organs, heal ulcers and pores and skin sores, slow cell aging, improve intellectual function, and is recommended in arthritis and muscle cramping, Thalassemia, Hemo-lytic anemia, cancer, asthma, allergy, inflammatory bowel disorder and detoxification.

Thus, it should be made part of day by day dietary intake of wheatgrass juice in order to discover its utmost benefits. The structural homology of chlorophyll with hemoglobin shows the role of chlorophyll as a blood builder in a variety of clinical stipulations involving hemoglobin deficiency. Thus it is called "green blood". To conclude wheatgrass looks to be very promising natural drug and sizeable lookup work is wished in order to discover its therapeutic potential in a variety of diseases in future.

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