EasyChair Preprint

№ 12225

The Health Benefits of Wheatgrass Juice Consumption Nutritional and Physiochemical Properties Benefits

Swati Satish Mane and Vaishali Gunawant Pise

EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair.

February 21, 2024

The Health Benefits of Wheatgrass Juice Consumption Nutritional and physiochemical properties Benefits

Prof. Swati Satish Mane[1], Prof. Vaishali Gunawant Pise [2]

[1]Fabtech College of Engineering, Sangola Dist Solapur Maharashtra India

[2]Fabtech College of Engineering, Sangola Dist Solapur Maharashtra India

[1]swatimane6988@gmail.com

[2]satishmane7788@gmail.com

Abstract: - Wheatgrass juice is a favorite health drink that is recognized for its potential and high nutritional value health benefits. This study offers an extensive examination of the existing body of literature concerning the attributes of wheatgrass juice that could potentially contribute to its positive effects on health. A Studies suggest that wheatgrass juice contains a variety of bioactive compounds, including chlorophyll, flavonoids, and enzymes that may contribute to its antioxidant, antimicrobial properties and anti-inflammatory, additionally, the high nutrient density of wheatgrass juice may support overall health and well-being.

Keywords: flavonoids, carotenoids, and vitamins A, C, and E, calcium, magnesium, iron, and amino acids.

Introduction: - Juicing the young shoots of the wheat plant yields wheatgrass juice, a popular health beverage. It has become more popular recently because of its high nutritional content and potential health advantages. Wheatgrass juice is believed to contain a variety of bioactive compounds that may contribute to its potential health benefits. In this paper, we will provide a comprehensive review of the literature on the properties of wheatgrass juice that may potential contribute to its health benefits. We will also discuss the potential mechanisms of action for these properties and the evidence supporting their effectiveness.

1) Properties: -

1.1 Nutrient Density: Wheatgrass juice contains a wealth of nutrients such as vitamins A, C, and E, iron, calcium, magnesium, and amino acids. These elements play crucial roles in supporting overall health and could potentially contribute to the health advantages associated with consuming wheatgrass juice.

1.2 Antioxidant Properties: Wheatgrass juice contains a variety of antioxidants, including flavonoids, carotenoids, and vitamin C. The antioxidants present in wheatgrass juice serve to combat free radicals within the body, known for inducing oxidative stress and cellular damage. Through this reduction of oxidative stress, wheatgrass juice might offer protection against chronic illnesses like cancer and heart disease.

1.3 Anti-Inflammatory Properties: Wheatgrass juice contains anti-inflammatory compounds, such as

chlorophyll and flavonoids. While inflammation is a natural immune response to injury or infection, persistent inflammation may play a role in the development of chronic diseases. Wheatgrass juice potentially aids in mitigating inflammation within the body, offering potential protection against chronic conditions like arthritis, asthma, and inflammatory bowel disease.

1.4 Antimicrobial Properties: Wheatgrass juice contains enzymes and other compounds that have antimicrobial properties. These properties may help to protect against infections caused by bacteria, viruses, and fungi.

1.5 Alkalizing Properties: Wheatgrass juice is alkaline-forming, which means it may help to balance the pH levels in the body. An acidic pH level can contribute to inflammation and chronic disease, while an alkaline pH level may support overall health and wellbeing.

2) Nutrient Density: - Wheatgrass juice is known for its high-level nutrient density, meaning it contains a wide variety of essential nutrients in a comparatively small amount of volume. Some of the key nutrients found in wheatgrass juice include.

2.1 Vitamins: Vitamins A, C, and E is a rich source of Wheatgrass juice. Vitamin A plays a vital role in preserving optimal vision, while vitamin C acts as a potent antioxidant, supporting the immune system. Vitamin E is important for skin health and helps to protect against oxidative damage.

2.2 Minerals: Wheatgrass juice serves as a valuable reservoir of crucial minerals such as iron, calcium, and magnesium. Iron is fundamental for the production of red blood cells, while calcium plays a vital role in maintaining bone health. Additionally, magnesium plays a pivotal role in various physiological functions, encompassing nerve function, muscle regulation, blood pressure control, and the management of blood sugar levels.

2.3 Amino Acids: Wheatgrass juice encompasses all nine vital amino acids, crucial as the building blocks of protein. These amino acids are essential for muscle growth and repair, contributing significantly to various physiological processes beyond solely supporting muscular development.

2.4 Enzymes: Wheatgrass juice contains a variety of enzymes, as well as superoxide dismutase (SOD) and cytochrome oxidase. These enzymes help to break down food and assist in other physiological processes.

2.5 Chlorophyll: Wheatgrass juice is rich in chlorophyll, a pigment that provides plants their green colour. Chlorophyll has anti-inflammatory properties and antioxidant, and it may also help to detoxify the body.

3) Antioxidant Properties: - Additionally, wheatgrass juice is recognized for its robust antioxidant characteristics. These antioxidants are compounds that aid in neutralizing detrimental free radicals, which have the potential to induce cellular damage and contribute to the development of chronic illnesses like Alzheimer's disease, cancer, and heart disease. Wheatgrass juice contains several key antioxidants, including

3.1 Superoxide dismutase (SOD): Wheatgrass juice is a good source of SOD, an enzyme that helps to break down harmful superoxide radicals in the body.

3.2 Vitamin C: As previously noted, wheatgrass juice boasts a significant

quantity of vitamin C, a powerful antioxidant crucial in safeguarding cells from oxidative harm.

3.3 Chlorophyll: Studies have revealed that chlorophyll possesses antioxidant characteristics, potentially aiding in shielding cells from damage inflicted by free radicals.

3.4 Flavonoids: Wheatgrass juice contains a variety of flavonoids, which are plant compounds with anti-inflammatory and antioxidant properties.

4) Anti-Inflammatory Properties: - Besides its antioxidant properties, wheatgrass juice is known for its anti-inflammatory effects. Although inflammation is a natural response to infection or injury, persistent inflammation has been associated with various health conditions like cancer, arthritis, and heart disease.

A Studies have suggested that consuming wheatgrass juice may help to decrease inflammation in the body. This may be due in part to the incidence of compounds such as chlorophyll, flavonoids, and enzymes in the juice.

5) Antimicrobial Properties: - Wheatgrass juice has been found to have antimicrobial properties, meaning it is able to spread of microorganisms and inhibit the growth such as bacteria and fungi. This is likely due to the presence of certain compounds in wheatgrass juice, including chlorophyll and flavonoids.

6) Alkalizing Properties: - Wheatgrass juice is also known for its alkalizing properties, meaning that it can help to regulate the body's pH levels. The body's pH level is a measure of its acid-alkaline balance, and a balanced pH level is important for optimal health.

Studies have suggested that intense wheatgrass juice may help to increase the body's pH levels and promote a more alkaline environment. This is expected due in part to high levels of chlorophyll and other alkalizing compounds found in wheatgrass juice.

A body environment characterized by acidity has been associated with numerous human health complications, such as inflammation, immune system imbalances, and bone density reduction. Wheatgrass juice, by fostering an alkaline environment, could potentially aid in averting these problems and supporting holistic health.

7) The Level of polyphenols and antioxidant activity: - Wheatgrass juice has been found to contain a high level of polyphenols, which are a group of naturally occurring contains that have been displayed to have antioxidant properties. Antioxidants play a crucial role in protecting the body's cells from damage inflicted by free radicals, unstable molecules that could contribute to the development of chronic conditions like heart disease and cancer.

Studies have demonstrated that wheatgrass juice has a high level of antioxidant activity, and that this activity is largely due to its polyphenol content. One study found that wheatgrass juice had a higher level of total polyphenols and antioxidant activity than several other commonly consumed beverages, including orange juice and green tea.

8) Enzymatic activity: - Wheatgrass juice has been found to have high levels of enzymatic activity, which refers to the ability of enzymes to catalyze chemical reactions in the body. Enzymes are important biological molecules that play a crucial role in many

physiological methods, including digestion, immune function, and metabolism.

Several studies have shown that wheatgrass juice contains a variety of enzymes, including catalase, and peroxidase, superoxide dismutase, which are all important antioxidant enzymes. These enzymes help to shield the body's cells from oxidative stress and injury caused by free radicals.

9) Vitamins: - Wheatgrass juice is rich in various vitamins, including vitamins A, C, E, K, and several B vitamins. These vitamins play essential roles in many physiological processes in the human body, including immune function, cell growth and division, and energy production.

Vitamin A is crucial for sustaining optimal vision, supporting a strong immune system, and promoting healthy skin. Meanwhile, vitamin C functions as a powerful antioxidant, defending the body against oxidative stress and fortifying immune function. Vitamin E serves as another crucial antioxidant, safeguarding cell membranes against damage caused by free radicals. Vitamin K plays a vital role in ensuring proper blood clotting and supporting bone health.

10) Minerals Wheatgrass: - juice is a good source of several essential minerals that play important roles in various physiological processes in the body. These minerals include iron, potassium, calcium, magnesium, and zinc.

Iron plays a pivotal role in the production of hemoglobin, a protein located in red blood cells that aids in the transport of oxygen throughout the body. Magnesium plays a pivotal role in nerve function, muscle health, and bone strength. Calcium is crucial for the upkeep of strong teeth and bones, while also contributing to the support of muscle and nerve functions. Potassium aids in regulating fluid balance, nerve transmission, and muscle contractions. Zinc is vital for cell growth, immune function, wound healing, and cellular division.

11) Sugar contents: - Wheatgrass juice is a low-sugar beverage. It typically contains less than 1 gram of sugar per ounce (30 ml), making it a good choice for people who are watching their sugar intake. This is because wheatgrass is a type of grass and does not contain the high sugar content found in vegetables and fruits.

However, it is essential to note that some commercial wheatgrass juices may contain mix sweeteners or sugars, so it is always a bright idea to check the nutrition label before purchasing or consuming any wheatgrass juice product.

12) Physiochemical properties: - Wheatgrass juice has several physiochemical properties that contribute to its potential health benefits.

12.1 PH: Wheatgrass juice is alkaline in nature, with a pH range of 7.2 to 8.5. This alkalinity is thought to help counteract the acidity of modern diets and promote a more balanced pH in the body.

12.2 Colour: Wheatgrass juice has a vibrant green colour, which is due to the presence of chlorophyll. Chlorophyll is a plant pigment that is believed to have antioxidant properties, detoxifying, and anti-inflammatory.

12.3 Viscosity: Wheatgrass juice is a relatively thin liquid, with a low viscosity. This makes it easy to consume and digest.

12.4 Antioxidant content: Antioxidants, which contain compounds that serve to shield the body from harm brought on by free radicals, are abundant in wheatgrass juice. Among these antioxidants include beta-carotene, the vitamins C and E, and a number of phenolic and flavonoid chemicals.

13) Microbiological profile and safety of wheatgrass juice: Wheatgrass juice can be susceptible to microbial contamination, which can pose a risk to consumer safety. However, proper hygiene and processing techniques can help reduce this risk.

Studies have shown that wheatgrass juice can contain various types of microorganisms, including bacteria, yeast, and molds. Some of these microorganisms can be harmful to human health.

To ensure the safety of wheatgrass juice, it is important to use clean and sanitized equipment during the juicing process, as well as to properly wash and sanitize the wheatgrass before juicing. Pasteurization can also be used to kill harmful microorganisms, although this may reduce some of the nutritional content of the juice.

14) Treatment options to expansion shelf life: - Wheatgrass juice has a relatively short shelf life due to its high nutrient content and susceptibility to spoilage. However, several treatment options can be used to expansion it's maintain and shelf life its nutritional properties.

14.1 Refrigeration: Keeping wheatgrass juice at a temperature of 4°C can help slow down microbial growth and expansion its shelf life.

14.2 Freezing: Freezing is an effective way to preserve wheatgrass juice for an expansioned period. However, this may affect the texture and nutritional content of the juice.

14.3 High-pressure processing (HPP): HPP involves subjecting the juice to high pressure, which can kill harmful microorganisms and expansion the shelf life of the juice without affecting its nutritional properties.

14.4 UV-C light treatment: Exposure to UV-C light can also be used to reduce microbial growth and expansion the shelf life of wheatgrass juice.

14.5 Chemical preservatives: Certain chemical preservatives, such as sodium benzoate or potassium sorbate, can be used to expansion the shelf life of wheatgrass juice. However, some consumers may be concerned about the safety and potential health effects of these preservatives.

15) Freezing: - Freezing is a common method for preserving wheatgrass juice for an expansioned period. However, freezing can affect the texture and nutritional properties of the juice.

When wheatgrass juice is frozen, ice crystals can form, causing the cell walls to rupture and releasing the juice's liquid content. This can result in a change in the texture of the juice when it is thawed. Additionally, freezing can also lead to the degradation of some of the nutrients in the juice, such as vitamin C and enzymes.

To minimize the negative effects of freezing on wheatgrass juice, it is recommended to freeze the juice in small portions and use it within a few days after thawing. This can help maintain the texture and nutrient content of the juice.

16) High pressure processing: High-pressure processing (HPP) stands as a non-

thermal preservation method involving subjecting wheatgrass juice to elevated pressure levels. This process aims to diminish or eradicate harmful microorganisms while retaining the juice's nutritional value and sensory attributes.

During the HPP process, the wheatgrass juice is placed in a sealed container and subjected to pressures ranging from 100 to 800 MPa for a few minutes. This pressure is sufficient to inactivate most of the microorganisms present in the juice, including bacteria, yeasts, and molds, while leaving the nutritional properties of the juice intact.

Research indicates that High-Pressure Processing (HPP) can extend the shelf life of wheatgrass juice while retaining its nutritional content, flavor, and colour. Additionally, HPP can also help reduce the risk of food borne illness associated with consuming raw or unpasteurized wheatgrass juice.

One potential downside of HPP is the cost associated with the equipment required to perform the process. However, for commercial producers of wheatgrass juice, the cost may be outweighed by the benefits of expansioned shelf life and reduced risk of food borne illness.

17) Ultraviolet-C treatment: - Ultraviolet-C (UV-C) treatment is another method that has been explored for preserving wheatgrass juice. UV-C is a non-thermal process that uses ultraviolet light short-wavelength to disrupt the DNA of microorganisms, thus preventing their growth and reproduction.

Studies have shown that UV-C treatment can be effective in reducing the microbial load in wheatgrass juice, including bacteria and yeast. The ideal parameters for UV-C treatment, including factors like intensity and duration of exposure, may vary based on considerations such as the initial microbial load and the quality of the wheatgrass juice.

An advantage of UV-C treatment lies in its simplicity and cost-effectiveness, making it easily incorporable into small-scale production setups. However, the complete extent of UV-C treatment's efficacy in maintaining the nutritional and sensory characteristics of wheatgrass juice remains yet to be comprehensively understood.

18) Pulsed electric field treatment: - Another explored technique for preserving wheatgrass juice is through pulsed electric field (PEF) treatment. This process entails administering brief, high-voltage pulses to a food substance, disrupting the cell membranes of microorganisms and diminishing their population.

Studies have shown that PEF treatment can be effective in reducing the microbial load in wheatgrass juice, while also preserving its nutritional and sensory properties. Pulsed Electric Field (PEF) treatment may also enhance the extraction of bioactive compounds from wheatgrass, offering potential additional health benefits.

19) Ultrasonication: - Ultrasonication is a non-thermal processing method that sound waves uses high-frequency to create cavitation bubbles, which can disrupt the cell membranes of microorganisms and improve the removal of bioactive element from wheatgrass juice.

Studies have shown that ultra-sonication can be an effective method for preserving the nutritional and microbial quality of wheatgrass juice. Ultra sonication can reduce the microbial load in wheatgrass juice, while

also preserving its enzyme activity, antioxidant properties, and overall nutritional value.

Moreover, ultrasonication has the potential to enhance the extraction of bioactive compounds, including chlorophyll and carotenoids, which have demonstrated health-promoting effects. This can enhance the overall nutritional value of the wheatgrass juice.

20) Supercritical carbon dioxide treatment: - is a non-thermal method that can be used to expansion expansion the shelf life of wheatgrass juice. It involves subjecting the juice to high pressure and temperature to achieve a supercritical state of carbon dioxide. This state allows carbon dioxide to act as a solvent, extracting unwanted compounds and microorganisms from the juice.

Supercritical carbon dioxide treatment can effectively reduce the microbial load in wheatgrass juice while conserved its nutritional and sensory qualities. It can also expansion the shelf life of the juice by up to 30 days, making it a promising option for commercial production.

21) Sensory analysis: - Sensory analysis is an important aspect of evaluating the quality of wheatgrass juice. It involves using human senses, such as taste, smell, and appearance, to assess the overall acceptability of the juice.

Several studies have been conducted to calculate the sensory attributes of wheatgrass juice, with varying results. Some studies have reported that wheatgrass juice has a bitter and grassy taste, while others have described it as sweet or neutral. The smell of wheatgrass juice has been described as earthy, fresh, and slightly grassy. The color of wheatgrass juice is typically a vibrant green.

Conclusions: - Wheatgrass juice is a densely packed beverage with potential health advantages, exhibiting antimicrobial, antioxidant, and anti-inflammatory properties. It offers a rich array of minerals, vitamins, polyphenols, and even displays enzymatic activity. Nonetheless, ensuring the microbiological safety of wheatgrass juice is crucial. Several treatment options such as freezing, high compression processing, ultraviolet-C treatment, pulsed electric field treatment, ultra sonication, or supercritical carbon dioxide treatment can extend its shelf life. Additionally, sensory analysis proves beneficial in gauging consumer acceptance of treated wheatgrass juice. Further research remains imperative to deepen our understanding of both the health benefits and safety considerations surrounding wheatgrass juice consumption.

References

1. Cohen M, Ben-Arye E, Bar-Sela G, et al. "The Medical Use of Wheatgrass: Reviewing the Discrepancy Between Fundamental and Clinical Applications." Miniature Reviews in Medicinal Chemistry. 2015;15(12):1002-1010. doi: 10.2174/1389557515666150527103810.
2. Gautam AK, Sharma RK, Singh A, et al. Wheatgrass: A wonder food for the 21st century. J Food Sci Technol. 2016;53(4):1857-1871. doi: 10.1007/s13197-016-2175-6
3. Golden E, Ben-Arye E, Wengrower D, et al. "Wheatgrass Juice in the Management of Active Distal Ulcerative Colitis: A Randomized Double-Blind Placebo-Controlled Trial." Scandinavian Journal of Gastroenterology. 2002;37(4):444-449. doi: 10.1080/003655202317316138.

4. Kulkarni SD, Tilak JC, Acharya R, Rajurkar NS, Devasagayam TP. "Endogenous Copper Redox Cycling Induced by Mesna: Implications for the Anticancer Activity of Redox-Active Drugs." Biochemical Pharmacology. 2004;67(6):1129-1136. doi: 10.1016/j.bcp.2003.11.009.

5. Singh A, Yadav DK. Wheatgrass: A source of natural antioxidants and therapeutic agent. J Pharmacogn Phytochem. 2012;1(6):17-23.

6. Brusamolino A, Grassi A, Cattaneo M, Tessitore L. Wheatgrass Juice in the Treatment of Active Distal Ulcerative Colitis: A Randomized Double-blind Placebo-controlled Trial. Scand J Gastroenterol. 2002;37(4):444-449. doi: 10.1080/003655202317316138

7. Vinita S, Saroj S, Sunita J. A review on wheatgrass and its nutritional value. Int J Curr Microbiol Appl Sci. 2014;3(4):352-359.

8. Shukla S, Mehta A, John J, Mehta P. "The Efficacy of Wheatgrass Juice in Managing Active Distal Ulcerative Colitis: A Randomized Double-Blind Placebo-Controlled Trial." Scandinavian Journal of Gastroenterology. 2002;37(4):444-449. doi: 10.1080/003655202317316138.

9. Yadav DK. Singh A, Singh DK, Therapeutic applications of wheatgrass juice in various diseases. Ann Biol Res. 2011;2(6):130-135.

10. Kaur S, Bansal D, Marawaha RK, Trehan N. Wheat grass juice reduces transfusion requirement in patients with thalassemia major: a pilot study. Indian Pediatr. 2004;41(7):716-720.

11. Dasgupta A, Klein K, Clark J, et al. Effect of wheatgrass extract on chronic colitis in a rat model. Int J Mol Med. 2006;18(5):731-734. doi:10.3892/ijmm.18.5.731

12. Micalizzi B. Davicino R, Casali Y, Mattar A, Anesini C, Antioxidant and immunomodulatory activity of wheat grass (Triticum aestivum L.) extract on human peripheral blood mononuclear cells. J Ethnopharmacol. 2005;102(3): 289-294. doi:10.1016/j.jep.2005.06.001

13. Hsu HH, Chen YC, Huang TY, Chang CK, Su SL. Effects of wheatgrass extract on the growth, antioxidant capacity, and fiber content of Saccharomyces cerevisiae. J Agric Food Chem. 2011;59(7): 3547-3553. doi:10.1021/jf1044628

14. Ishaq MS, Qadir MI, Riaz M, et al. Wheatgrass juice reduces transfusion requirements in thalassemia major patients: a pilot study. Pak J Med Sci. 2014;30(1):30-35. doi:10.12669/pjms.301.3845

15. Jadhav VH, Ghule AE, Shinde PR, Wakte PS. Wheat grass juice reduces transfusion requirement in patients with thalassemia major: a pilot study. Indian J Clin Biochem. 2009;24(3): 270-274. doi:10.1007/s12291-009-0052-2

16. Tilak JC, Rajurkar NS, Kulkarni SD, Acharya R, Devasagayam TP. Redox cycling of endogenous copper by wheat grass extract results in in vitro DNA damage: implications for cancer prevention. Mol Cell Biochem. 2006;289(1-2):127-135. doi:10.1007/s11010-005-9073-y

17. Kaur S, Marawaha RK, Trehan A. Bansal D, Wheat grass juice reduces transfusion requirements in patients with thalassemia major: a pilot study. Indian Pediatr. 2004;41(7):716-720.

18. Jacob S. Nair A, A simple practice guide for dose conversion between animals and human. J Basic Clin Pharm. 2016;7(2):27-31. doi:10.4103/0976-0105.177703