

Research Article

Therapeutic Use of Wheat Grass Juice for the Treatment of Anemia in Young Women of Ajmer City (Rajasthan, India)

Mathur S, Mathur R* and Kohli GK

Department of Food Science and Nutrition, Maharshi Dayanand Saraswati University, India

***Corresponding author:** Ritu Mathur, Department of Food Science and Nutrition, Maharshi Dayanand Saraswati University, Ajmer, Rajasthan, India**Received:** December 09, 2016; **Accepted:** January 12, 2017; **Published:** January 20, 2017**Abstract**

Background: The fresh juice of *Triticum aestivum* (the common wheat plant) prepared from Cotyledons of wheat extensively is being used for therapeutic purposes. Wheat grass juice is rich in chlorophyll (whose structure is similar to haemoglobin except the central moiety), amino acids, minerals (like Iron), vitamins (like B₁₂), and active enzymes. The pH of blood and wheat grass juice is also the same i.e. 7.4. Therefore wheat grass juice gets quickly absorbed in the blood and is often referred to as Green Blood and is used therapeutically for the treatment of various problems including anemia, thalassemia, etc.

Aim: To study the effect of wheat grass juice on blood haemoglobin level for the treatment of anemia.

Methodology: Anaemic women aged between 35-45 years were selected by purposive sampling after biochemical estimation of blood haemoglobin level using Sahli's Method. Thirty subjects (n= 30) (grouped as Test and Control [15 each]) were selected. Wheat grass juice (30 ml per day) was given for 30 days to the test group following proper procedures and timings. Biochemical estimation was repeated after 1 month for haemoglobin level of both the groups using Sahli's method.

Result: Most of the subjects were found moderately anaemic in the beginning. After 1 month of Intervention with wheat grass juice there was an Average 3g/dl increase in haemoglobin level of test group and no change was seen in the control group. Results showed that the juice also acted as a laxative as it relieved constipation among many subjects.

Conclusion: Wheat grass juice has significant effect on blood haemoglobin level and helps to cure anemia. No side effect of juice was complained by any of the subjects.

Keywords: Wheat grass juice; Anemia; Haemoglobin; Chlorophyll

Introduction

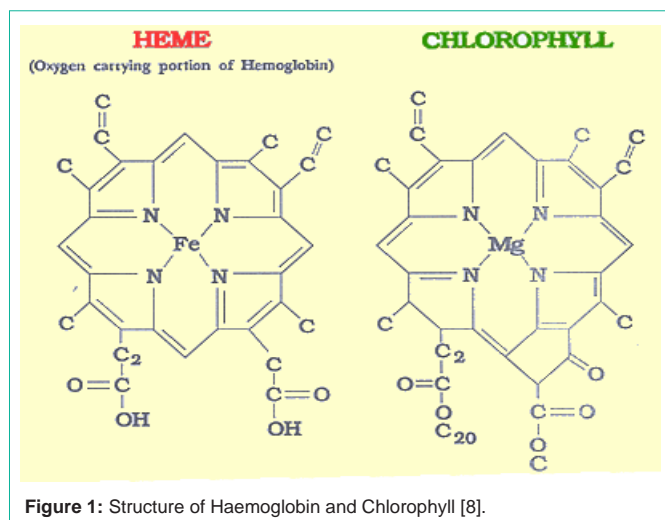
Wheat grass juice is extracted from the cotyledons of the common wheat plant *Triticum aestivum*. It has been used therapeutically from years all around the world because of its healing properties. The juice from wheat grass is high in chlorophyll, active enzymes, vitamins and other important nutrients like Iron [1]. The chlorophyll present in wheat grass and haemoglobin has similar structures except for the central moieties. Also the pH of wheat grass juice is 7.4 which are the same as that of blood. Therefore it is absorbed quickly in the blood and is often referred to as Green Blood. This juice is extensively used therapeutically for the management of diseases like Anemia, Thalassemia, Inflammatory Bowel diseases, etc [2].

According to the National Family Health Survey- 3, more than half of women (55 percent) aged between 15 to 49 years are Anaemic. Nutritional deficiency anaemia refers to a decrease in the concentration of haemoglobin in the blood due to poor dietary habits that causes deficiency of iron, proteins, vitamins like vitamin C, vitamin B₁₂ along with folic acid. Deficiency of the above nutrients

can affect the production of red blood cells. Anaemia is a wide spread public health problem which is associated with an increased risk of morbidity and mortality. India is among the countries with the highest prevalence of iron deficiency anemia in the world [3].

The reduction in oxygen available to organs and tissues when haemoglobin levels are low is responsible for many of the symptoms experienced by anaemic people. The consequences of anaemia include general body weakness, frequent tiredness, and lowered resistance to disease. Anaemia can be a particularly serious problem for pregnant women, leading to premature delivery and low birth weight. It is of concern in children since anaemia is associated with impaired mental and physical development. Haemoglobin testing is the primary method of Anaemia diagnosis [4].

Age is associated with the category of Anaemia, with older women being somewhat more likely to be moderately or severely anaemic than younger women. The rate of moderate-to-severe Anaemia (moderate and severe Anaemia combined) among women of age 35-49 is almost three times as high as among girls of age 15-19 [4].



Anemia can be treated by including iron, folic acid, and vitamin B₁₂, vitamin C rich foods in diet. These nutrients can also be supplemented as drugs or in any other form like wheat grass juice [4].

Wheat grass refers to the young grass of the common wheat plant, *Triticum aestivum*, which is freshly juiced or dried into powder form for animal and human consumption. Both the forms provide chlorophyll, amino acids, vitamins, and active enzymes like protease, amylase, lipase, cytochrome oxidase, transhydrogenase, Super Oxide Dismutase (SOD) [5] (Enzymes are the digestive elements. The substances in the WGJ are helpful for dyspepsia. These are helpful for Digestion, building a healthy body and counteract the premature aging) [6] which are responsible for its pharmacological actions. It contains a plethora of minerals like iron, calcium, phosphorus, magnesium, alkaline earth metals, potassium, zinc, boron, and molybdenum. It is a superior source of chlorophyll appropriately referred to as the “green blood”. Various chlorophyll rich greens are being used from variable sources, since prehistoric times, as blood builders. Wheat grass has been proclaimed to improve blood flow, aid in digestion and in general detoxification of the body [7].

Wheat grass is a natural food. According to Dr. Anne Wig more who rediscovered the nutritional qualities of wheatgrass juice in 1960, the juice has helped hundreds of thousands of people around the world to overcome serious health problems [8].

The other notable feature of wheat grass is its high proportion of amino acids like arginine, serine, lysine, aspartic acid, glycine, alanine, methionine, leucine, tryptophane, phenylalanine, and valine. The major clinical utility of wheat grass juice is due to its antioxidant action which is derived from its high content of bioflavonoid. Other compounds present, which make this grass therapeutically effective is choline. Being highly anti-bacterial, consuming wheatgrass will help to alkalise and detoxify the lymph and blood cells, helping the body to rebuild and transport toxins out of the body quickly and effectively [1].

The fully grown, harvested, stored, milled and prepared wheat plant is highly acidifying. But as with almost every grain, when sprouted it is very alkaline, and this is certainly the case with wheat grass [9]. Therefore it is given in the form of juice after seven days of

growth of cotyledons of wheat plant [8].

Chlorophyll as green blood [1] - The analogy between chlorophyll and haemoglobin can be demonstrated with respect to the structure of their porphyrin heads. The structure of both the compounds depicts a striking similarity in having a tetra pyrrole ring structure, the only difference between the two being the nature of the central metal atom magnesium (Mg) in chlorophyll and iron (Fe) in haemoglobin (Figure 1). Also the PH of wheat grass juice is similar to blood i.e. 7.4 which help it to get absorbed in the blood quickly [8]. Therefore this juice is often referred to as ‘Green Blood’.

Therefore wheat grass juice helps to build blood and is therapeutically used as-

- It increases the red blood count [1].
- Blood builder in thalassemia major [10].
- Adjuvant therapy in hemolytic anemia [1].
- Supportive care for terminally ill cancer patients [11].
- Management of inflammatory bowel disease. It improves digestion and metabolism [1].
 - Acts as Detoxifying agent. It contains antioxidants which repair damaged cells and rejuvenates aging cells. It purifies the blood and cleanses the kidneys, liver and urinary tract [5]. Wheat Grass Supplementation Decreases Oxidative Stress [12].
 - Wheat-grass juice removes weakness and fatigue. It is immediately absorbed in the blood stream and gives instant energy [7].
 - It has shown to have a powerful impact on the treatment of different skin problems like burns Insect bites, wounds, psoriasis and much type cancers [6].
 - Antiasthmatic and Antiallergic agent [1].
 - It boosts the immune system and the nervous system [7].
 - It enhances the capillaries and reduces high blood pressure. It improves blood disorders [7]
 - Wheat-grass juice prevents greying of hair and removes dandruff [7].
 - Gargling with wheat-grass juice relieves sore throat [7].
 - It is an excellent skin cleanser. It treats acne and pimple problems. It removes the acne scars [8].
 - Wheatgrass juice is used in the treatment of active distal ulcerative colitis [13].
 - Balancing fat in the body. It is an appetite suppressant [8].
 - Wheat-grass juice is suitable for diabetics as it regulates blood sugar levels [8].
 - One of the studies at the University of California showed that wheat grass contains an enzyme P4D1 capable of repairing faulty DNA [6].

Anemia is the most common disorder of the blood. There are

several kinds of anemia, produced by a variety of underlying causes. It goes undetermined in many people, and symptoms can be minor or vague. The signs and symptoms can be related to the Anemia itself, or the underlying cause [4].

There are several types and classifications of anemia. This is a condition in which the body lacks the amount of red blood cells to keep up with the body's demand for oxygen. Understanding the different classifications can help to recognise the symptoms and also to avoid anemia in the first place [4].

Prevalence of anemia

Anaemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. It occurs at all stages of the life cycle, but is more prevalent in women and young children [14].

According to National Family Health Survey-3-More than half of women (55 percent) and almost one-quarter of men (24 percent) are anaemic. Thirty-nine percent of women have mild anaemia, 15 percent have moderate anaemia, and 2 percent have severe anaemia. Among men, 13 percent have mild anaemia, 10 percent have moderate anaemia, and 1 percent has severe anaemia. The level of anaemia exceeds 50 percent for every group of women studied except for Sikhs, Jains, women with 10 or more years of education, and women in the highest wealth quintile. Pregnant women are slightly more likely to be anaemic (59 percent) than non-pregnant women (55 percent) [3].

Types of anemia [15]

Iron deficiency anemia- Iron deficiency anemia is a condition in which the body has too little iron in the blood stream (For Indians Recommended Dietary Allowances for Iron for Normal adult male is 17mg/dl and for normal adult female is 21mg/dl which changes during pregnancy and lactation) [16]. It is microcytic anemia in which size of RBC reduces from normal size. This form of anemia is more common in adolescents and in women before menopause. Blood loss from heavy periods, internal bleeding from the gastrointestinal tract, or donating too much blood can all contribute to this disease. Other causes can be from poor dietary habits or from chronic intestinal diseases. Treatment is usually done by orally supplementing iron and dietary modifications [17].

Folic acid deficiency anemia- This form of anemia is characterised by a lack of folic acid, one of the B group of vitamins, in the blood stream. It is macrocytic anemia in which RBC enlarges. This is usually caused by an inadequate intake of folic acid, usually found in vegetables or by the overcooking of the vegetables. Alcoholism can also be a contributing factor in this form of anemia. During pregnancy when the folic acid is used more or in infancy, this disease can also manifest itself. It can also be caused as a side effect of other blood disorders. This condition can be avoided by including foods with folic acid in the diet. Such foods include beef liver, asparagus, and red beans.

Pernicious anemia- Pernicious anemia usually affects people between the ages of 50 and 60 and is a result of a lack of vitamin B₁₂. The disease can be hereditary but some forms of the condition can be autoimmune diseases. People who have any autoimmune diseases

are more likely to contract pernicious anemia. It is also macrocytic anemia [17].

Aplastic anemia- Aplastic anemia is caused by an absence or reduction of red blood cells. This can happen through injury where the blood forming tissue in the bone marrow is destroyed. Because of this, the sufferer is unable to fight infection and is likely to be a heavy bleeder. There is no definite known cause for aplastic anemia but it is thought to be caused by exposure to certain toxins and also to the hepatitis virus.

Sickle cell anemia- This form of anemia is of a hereditary nature and is a result of an abnormal type of red blood cells. Sickle cell anemia is a life threatening disease and there is no prevention. Complications include leg ulcers, shock, cerebral haemorrhage, and orthopaedic disorders.

Grading of anemia

WHO Grading of Anemia: according to level of haemoglobin in blood [18]:

Grade 1 (Mild Anemia): < 10 g/dl

Grade 2 (Moderate Anemia): 7-10 g/dl

Grade 3 (Severe Anemia): < 7 g/dl

Anemia is mainly diagnosed by haemoglobin level in blood. Haemoglobin concentration measurement is among the most commonly performed blood test, usually as part of a Complete Blood Count.

Results are reported in g/L, g/dL or mol/L. Normal levels are:

Men: 13.8 to 18.0 g/dL (138 to 182 g/L, or 8.56 to 11.3 mmol/L)

Women: 12.1 to 15.1 g/dL (121 to 151 g/L, or 7.51 to 9.37 mmol/L)

Children: 11 to 16 g/dL (111 to 160 g/L, or 6.83 to 9.93 mmol/L)

Pregnant women: 11 to 12 g/dL (110 to 120 g/L, or 6.83 to 7.45 mmol/L)

If the concentration is below normal, this is called Anemia [14].

Objectives

The present study was undertaken with the following objectives:

1. Assessment of nutritional status of women (aged 35 to 45 years) for the prevalence of anemia.
2. Therapeutic trials with wheat grass juice (30 ml/day for 30 days) for the prevention and control of anemia.
3. Assessing the impact of intervention with wheat grass juice on blood haemoglobin levels.

Methodology

Selection of area

Ajmer city through random selection.

Selection of subjects

Through purposive sampling method 30 subjects were selected (15 Control group & 15 Test Group) [19]. Subjects were women of age 35 to 45 years as at this age they are more prone to Anemia (as it

Table 1: Nutritional value of Wheat Grass Juice per 100g (3.5oz) [6].

Energy- 327 Kcal	Protein- 12.63g
Carbohydrates- 71.18g	Fat- 1.54g
Sugar- 0.41g	
Dietary fibre- 12.2g	
Iron- 126 mg	Calcium- 29mg
Magnesium- 3.985mg	Phosphorus- 288mg
Potassium- 363mg	Sodium- 2mg
Thiamine- 0.383mg	Riboflavin- 0.115mg
Niacin- 5.464 mg	Pantothenic acid- 0.954 mg
Pyridoxine- 0.3mg	Folate - 38µg
Vitamin E- 1.01mg	Choline - 3.12mg
Vitamin K- 1.9µg	Zinc (28%) 2.65 mg

is their reproductive age and premenopausal age).

Biochemical test for diagnosis of anemia

Sahli's method used for determination or estimation of blood haemoglobin level (both pre and post supplementation of juice). It works on the principle-Hydrochloric acid convert's haemoglobin into acid haematin. The brown coloured compound is matched against a brown glass standard in a comparator [20].

The criterion of selecting the subjects was that anaemic patients were not taking any medication or any other supplementation for treatment of anaemia.

Collection of data

General information as age, marital status, qualifications, occupation; Specific information like ages of menarche, menstrual history, eating habits were collected with the help of questionnaire.

Complete nutritional status of the subjects was done which included dietary assessment, anthropometry, biochemical and clinical assessment and questionnaires were filled to gain knowledge about the subjects' pattern of food consumption, number of meals, dietary habits, likes and dislikes, 3 day recall of diet, etc.

Intervention with wheat grass juice

The intervention with wheat grass juice done with 30 subjects i.e. women of age 35 to 45 years for one month.

Out of these 30 subjects 15 subjects were test or experimental group and were given 30 ml of wheat grass juice everyday early in the morning for 30 days. Special care was taken that the subjects were not taking any other supplements or drugs for control and cure of anemia.

Other 15 subjects were control group who were not provided with any supplementation.

After 7 days of growth of wheat grass or cotyledons they were removed and grinded for preparing the juice. One serving of juice is 30 ml.

Supplementation [8]

About 30 ml of wheat grass juice can be given per day i.e. 1 serving of wheat grass juice is about 30 ml prepared from cotyledons of wheat. Usually it is taken empty stomach and therefore taken early morning. Therefore it was given to subjects after following proper

Table 2: Impact of intervention with Wheat grass juice through Haemoglobin (Hb) level Pre and Post Intervention with juice.

	Group	n	Mean (g/dl) ± SD
Hb level Pre Intervention	Test	15	8.7467 ± 0.997776
	Control	15	8.6800 ± 0.65814
Hb level Post Intervention	Test	15	11.4867 ± 1.22874
	Control	15	8.6867 ± 0.66210

Table 3: Relief from constipation after consumption of juice.

Details		Group	
		Test	Total
Yes	n	8	8
	%	53.3%	53.3%
No	n	0	0
	%	0%	0%
Not suffering from constipation	n	7	7
	%	46.7%	46.7%

Table 4: Side effects experienced after consumption of juice.

Details		Group	
		Test	Total
No	n	13	13
	%	86.7%	86.7%
Headache	n	1	1
	%	6.7%	6.7%
Nausea	n	0	0
	%	0%	0%
Stomach-ache	n	1	1
	%	6.7%	6.7%

procedures and care (Table 1).

After 1 month of intervention, biochemical estimation of blood hemoglobin level was done again using Sahli's Apparatus. Results were calculated using statistical methods [21].

Result

Table 2 depicts that Pre Intervention the mean haemoglobin level of the subjects of test group was 8.7 g/dl and Post Intervention it was found to be increased to about 11.4 g/dl. There was about 3 g/dl increase in haemoglobin level of blood. This shows a positive impact of intervention with wheat grass juice for treatment of anemia.

Also, in the control group the mean haemoglobin levels of blood Pre Intervention was about 8.6 g/dl and Post Intervention also it was found to be 8.6 g/dl. This shows that there was not any increase or decrease in the haemoglobin level of subjects of control group as they were not supplied with any kind of juice during the period of intervention.

Table 3 shows that 53% of the subjects of test group were relieved from constipation after consumption of wheat grass juice. Rest 47% was not suffering from constipation.

Table 4 shows that 13 subjects from the test group didn't complain

of any side effects of wheat grass juice. Only 1 subject complained about head ache at the beginning of intervention and only 1 complained about stomach ache also at the beginning of intervention. The reason for headache was that the wheat grass is known to have a cleansing effect on the body. When our bodies become accustomed to certain stimulants such as sugar or caffeine, the cleansing process can eliminate those stimulants from our bodies. Since the brain becomes used to having these types of pick-me-ups and suddenly stops receiving them, it often results in a headache. Also the reason for stomach ache was that the juice helps in relieving constipation.

Conclusion

The use of wheat grass juice for increasing the blood haemoglobin level is one of the simple remedy for treating anemia. The beneficial effects of wheat grass juice have been established by studies done with subjects.

The findings revealed that most of the subjects coming under the age group 35 to 45 years were moderately anaemic. No subject from the test group complained about the taste of wheat grass juice. In the beginning a few subjects complained about headache stomach ache, but this was automatically stopped after some time when their body became used to with the juice. Many subjects were relieved from constipation after consumption of wheat grass juice, this depicts that wheat grass juice has ability to relieve from constipation.

The study about the impact of intervention with wheat grass juice on blood haemoglobin level revealed that all the subjects from the test group found an increase in their haemoglobin level of blood. There was an increase of about 3 g/dl in the haemoglobin level. This was proved with the help of biochemical estimation at the beginning and end of intervention. In the beginning the mean haemoglobin level of the subjects was about 8.7 g/dl i.e. they were moderately anaemic and after intervention the mean was found to be 11.4 g/dl.

This shows that there is a positive effect of wheat grass juice on blood haemoglobin level i.e. the haemoglobin level of subjects raised after consumption of juice for 30 days. Therefore wheat grass juice proved to be useful for the treatment of any kind nutritional deficiency of anemia.

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