

Value Added Product Development from Wheat Grass Juice to cure Constipation

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Abstract

The present research work was conducted to standardize and examine different products of wheat grass juice for their sensory characteristics & to assess the clinical effect value of wheat grass juice on constipation. The value added products such as wheat grass soda, wheat grass juice, wheat grass lemonade, pineapple with wheat grass were developed from wheat grass juice. All the prepared products were acceptable through the study with slight decrease in overall acceptability. The subjects suffering from constipation were given wheat grass lemonade one time in a day which contained 4-8 oz. daily and significant improvement in the case of constipation was observed after administration of wheat grass products for 60 days in terms of colour, consistency and frequency of passing faeces. So incorporation of wheat grass juice and its products into existing dietary pattern will prove beneficial for a healthy body.

Keywords

Wheat grass juice, value added products, constipation, wheat grass lemonade, overall acceptability

Introduction

Wheat (*Triticum astivum*) is one of the major cereal produced and consumed all over the world. It is an annual crop. It consists of a compressed shoot and linear leaves in initial phase of growth. It is referred to young shoots or grass of wheat plant (*triticum astivum*) that is juiced and consumed either fresh or after drying (Mujoriya and Bodla, 2011). It is prepared generally after germination for a period of 6-10 days. Wheat grass is very popular for its good vitamin, mineral, protein and antioxidant content from over fifty years of research work (Tirgar and Desai, 2011). Potential health benefits of wheat grass are

well known all over the earth. It is available in the form of a juice or powder concentrate in the market.

Wheat grass is different from wheat malt as it is available in freeze dried or fresh form, on the other hand, wheat malt is dried convectively. Wheat grass is also richer in chlorophyll, amino acids, minerals, vitamins and enzymes than malt as it is grown longer than malt.

Nutritional composition of Wheat grass

Wheat grass is good for protein, potassium, dietary fibre and vitamins including all fat and water soluble vitamins, iron, zinc, copper, manganese and selenium (Anonymous, 2012). Wheat grass is harvested prior to the formation of flower head in the plant. It is rich in various phytochemicals including alkaloids, gums, carbohydrates, saponin and mucilage. It's water soluble extractive value is richer than alcohol extractive as 70% of chlorophyll is water soluble (Anonymous, 2002; 011).

Nutrients	Wheat grass juice	Broccoli	Spinach
Protein (mg)	860	800	810
Beta carotene (IU)	120	177	2658
Vitamin E (mcg)	880	220	580
Vitamin C (mg)	1	25.3	8
Vitamin B12 (mcg)	0.3	0	0
Phosphorus (mg)	21	19	14
Magnesium (mg)	8	6	22
Calcium (mg)	7.2	13	28
Iron (mg)	0.66	0.21	0.77
Potassium (mg)	42	90	158

Table 1. Comparison of nutritive value of wheat grass v/s common vegetables

Suggested doses of wheat grass juice

As per Anonymous (2008), suggested doses of wheat grass for normal health maintenance are 1-4 oz daily and it is 4-8 oz per day for therapeutic purposes.

- **Calories:** One serving of wheat grass juice provides 7.5 calories out of which 5.5 calories comes from carbohydrates, while rest 2.5 calories are derived by proteins as it doesn't contain any fat
- **Minerals & vitamins:** One serving of wheat grass juice provides 1.5 mg of iron, 5 mg of sodium and 4.5 mg of vitamin C (Newbacher, 2010).

Benefits or uses of wheat grass

- Nutritional value of 30 ml of wheat grass juice is comparable to 1 kg of green leafy vegetables
- Wheat grass is alkaline in nature being high in minerals like potassium, calcium, magnesium and sodium
- Wheat grass is rich in different enzymes like proteases, cytochrome oxidase, amylase, lipase, transhydrogenase & superoxide dismutase that are important for various biological functions.
- Various nutritional deficiencies are very common all over the world like deficiency of vitamin B12, iron & folic acid (Brown, 1991). Wheat grass helpful in combating problem of anaemia as well as in enhancing physical stamina of the body by increasing oxygenation as it helps in synthesis of more red blood cells
- Not only anaemia, but also blood pressure can be controlled by wheat grass as it's chlorophyll content dilates the blood vessels and eliminates carbon dioxide and free radicals from the body (Anonymous, 2002).
- Wheat grass is a good detoxifier being rich in antioxidants like vitamin C, E and β carotene (Wigmore, 2009).

Wheat grass is highly beneficial as it is a living food, having properties of antibacterial, alkalize and detoxifies body very effectively. Some of the benefits are as follow:

- It helps strengthen immune system
- It helps blood detoxification, removing foul odours of breath and sweat
- Maintains blood's normal pH level

- Increases haemoglobin by increasing red blood cell count
- It is helpful in improving reproductive health
- It is helpful in many ailments like obesity, constipation, acidity, piles, ulcers, Thalassemia, anaemia, leukaemia, cancer, diabetes, heart problems and arthritis etc. as it is rich in dietary fibre, antioxidants, protein, mineral and vitamins
- It is a good skin and muscle toner (Kim, 2006; Leong, 2006)

Thus it can be concluded from the above facts that health and well being depends more upon good nutrition than any other factor. Unhealthy food, irregular meals and consumption of fast food may lead to poor health.

Objectives of the study

- To develop and standardize organoleptically acceptable products of wheat grass for effective utilization
- To assess the clinical effect value of wheat grass juice on constipation

Rationale of the study

The human body obtains the required energy and nutrients from food. Our cells cannot absorb these nutrients until the food is digested. According to Li and Leung (2017), constipation may occur by a number of factors including poor diet specially lacking fibre and fluid, sedentary lifestyle, drug's side effects, hypothyroidism, sex hormones and colorectal cancer etc. Wheat grass contains fibre that reduces constipation.

Limitations of the study

The present study has its own limitation with regards to sample, study area, money and other resources as confronted by a single student researches. It was a micro level study confined to this areas on a single variety. This study was a humble attempt to provide some insight into the uses of wheat grass.

Research Methodology

The present investigation was undertaken to standardize and develop value added products from wheat grass and to assess their clinical effects on constipation. The idea

behind the study was to promote the use of wheat grass in food products to increase its consumption. The main aim of the study is effective utilization of wheat grass for product development. Wheat grass is a plant and it is the most potent healthy substance on the earth. It has fair amount of protein and a rich source of vitamin E. It has nutritive value as well as therapeutic value. The research methodology has been described under following heads -

- Research Plan
- Locale of investigation and selection of samples
- Development and standardization of products
- Sensory evaluation or organoleptic evaluation of various products prepared using wheat grass juice
- Assessment of Clinical effects of wheat grass product on constipation patients
- Statistical analysis

- **Research Plan**

Wheat grass was selected for the study due to its easy accessibility, low cost and local availability for product development and general awareness

- **Locale of investigation and selection of samples**

Purposive sampling was done for the selection of subjects from Smt. Indramani Mandelia Shiksha Niketan, Pilani, Jhunjhunu for the purpose of:

- Easy accessibility of the subjects
- Sample (subject) availability

Procurement of material

The wheat grass plant was grown by the researcher herself from July to August into an open to field area.

Cultivation of wheat grass

- Empty land was cleaned
- It was softened to remove lumps
- Wheat seeds were poured in the soil in straight lines using finger or a spoon
- Wheat seeds were covered with soil

- Seeds were watered thoroughly
- Till the seeds shoot up watering was done regularly and in small quantities
- After shoots were formed, watering was done generously
- When the grass was grown full, blades were cut with a pair of scissors, $\frac{1}{4}$ was left at the root to grow again
- The wheat grass was not left to mature and ripen as it was of no use

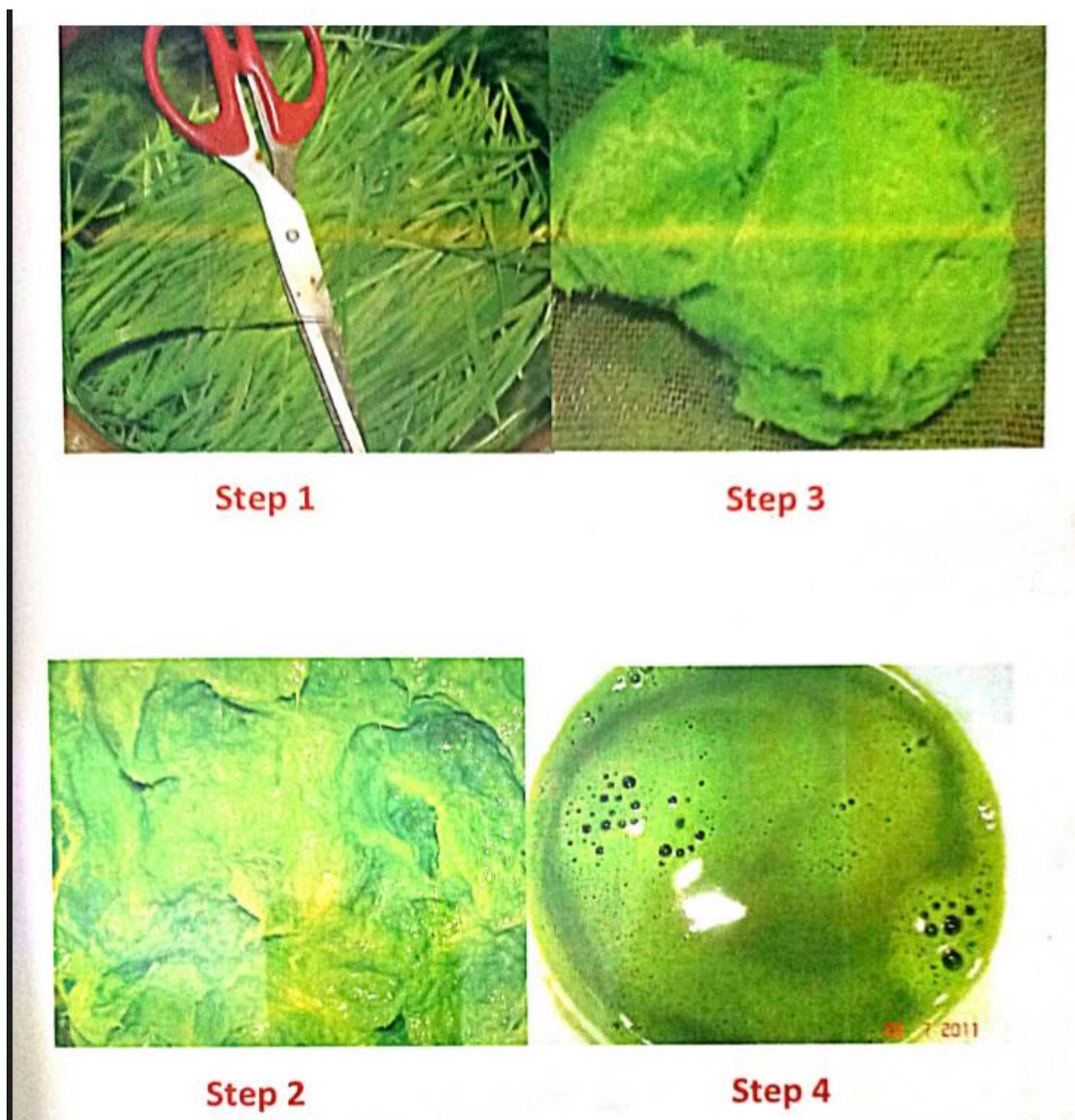


Figure1: Preparation of Wheat grass juice

Selection of samples

Selection of the samples for the study, total 20 subjects were selected purposively in the age group ranging from 18-20 yrs who were suffering from chronic constipation from undergraduate to post graduate classes registered in Smt. Indramani Mandelia College, Pilani.

Development and standardization of the products

Wheat grass juice: Various products were developed and standardized using wheat grass juice. The products, thus prepared were wheat grass soda, sweet fruit and wheat grass juice, wheat grass lemonade, orange grass juice, pineapple mix grass juice (Plate I, II, III, IV, V).

Wheat grass soda

Ingredients	Amount
Lemon juice	80 g
Sugar	80 g
Soda	80 g
Fresh organic wheat grass juice	56 g

Mix lemon juice, sugar, soda and wheat grass juice to prepare wheat grass soda.

Sweet fruit and wheat grass juice

Ingredient	Amount
Red apple	2 large
Orange	1 large
Honey	1 tsp
Finely ground cinnamon	pinch
Wheat grass juice	1 ounce shot

Apple and orange juice was prepared in a juicer. Combined this juice with wheat grass juice in a container and mixed well. Honey was added to these juices and served with a sprinkle of cinnamon.

Orange grass juice

Ingredient	Amount
Apple	2
Orange	2
Wheat grass juice	100 g

Orange to fit through juicer. Mix apple juice orange and add wheat grass juice.

Wheat grass lemonade

Ingredients	Amount
Lemons	2
Sugar	3-4 tbsp
Black salt	½ tsp
Roasted jeera powder	¼ tsp
Wheat grass juice	100 g
Salt	taste
Mint leaves	for garnishing

Mix wheat grass juice, sugar, lemon, black salt, jeera powder and salt together in a blender. Strain the mixture and add 1glass water. Pour this in long glasses and serve with ice cubes and garnished with mint leaves.

- **Sensory Evaluation or organoleptic evaluation of various products prepared using wheat grass juice**

For the purpose of assessment of acceptability for various wheat grass products, a 9 point hedonic scale test was used as a tool that assessed acceptability of the products in terms of colour, taste, flavour, texture, appearance and overall acceptability. The sensory characteristics of product 9 point hedonic scale.

- **Assessment of clinical effect of wheat grass juice on constipation patients**

To assess the clinical impact of wheat grass juice on constipation, 20 subjects were selected by purposive sampling technique from Pilani, who were between the age group of 18-20 years and suffering from constipation.

Duration: The study was carried out for 2 months

Dosage: 8 oz daily

Data collection

Section I

The data regarding the lifestyle and diet intake was collected using personal interview method and responses were obtained from the subjects. A well instructed schedule was prepared for the collection of information in two sections.

Section II

This section included information regarding the consistency, frequency and colour of faecal matter. The assessment was carried out at day zero followed by an interval of 10 days till 50 days. The changes in the parameter of fecal matter were noted for all 20 subjects during this period

• **Statistical analysis**

Data obtained from laboratory experiment and organoleptic evaluation was subjected to mean calculation to have an average value of “n’ observation.

Mean: the formula for mean for ungrouped data

$$M = \sum x_i / n$$

the formula for mean for ungrouped data

$$M = \sum f_i x_i / n$$

Where $\sum$ is the mathematical sum of values represented by x

x_i are the values

N is the total no. of values

f_i is the frequency of a particular value

Standard deviation

$$SD = \sqrt{1/N \sum f_i (x_i - \bar{x})^2}$$

Where $N = \sum f_i$

x_i = sum of x_i of a given message

$\bar{x}$ = mean score s of a given message

N = No. of respondents

SD = Standard deviation

Results & Discussion

The present study was performed to study the effective utilization of wheat grass for development of value added products and their assessment for clinical effects on constipation. The products using wheat grass juice were developed . Wheat grass juice was used as medicinal therapy for the cure of constipation. The results of the present investigation have been presented and discussed under following headings

- Preparation and sensory evaluation of wheat grass juice
- Preparation, standardization and sensory evaluation of different products
- Clinical effects of wheat grass on constipation

- **Preparation and sensory evaluation of wheat grass juice**

For the preparation of wheat grass juice, it was crushed in a pestle soon after cutting it and juice was extracted by putting this crushed matter in a clean thin cloth and squeezing it. Magnetically treated water was used for juice extraction to increase yield of juice with high effectiveness.

Mean score of sensory evaluation of wheat grass juice

Product	Colour	Flavour	Taste	Uniformity	Consistency	Overall acceptability
Wheat grass juice	8.00±0.56	8.50±0.62	8.55±0.52	8.30±0.82	8.20±0.68	8.76±0.92

- **Preparation, standardization and sensory evaluation of different products made using wheat grass juice**

The data with respect to organoleptic characteristics such as colour, flavour, taste, uniformity, consistency, and overall acceptability are presented with mean score for different products of wheat grass (wheat grass soda, orange grass juice, sweet grass juice, wheat grass lemonade, pineapple with wheat grass juice) are presented below all the recipes mentioned above were standardized as for wheat grass soda is concerned it was prepared using lemonade (lemon, sugar and soda) and wheat grass juice. Wheat grass soda was liked extremely by the panel of 10 judges.

Mean score of sensory evaluation of wheat grass soda

Product	Colour	Flavour	Taste	Uniformity	Consistency	Overall acceptability
Wheat grass soda	7.70±0.6 7	7.00±0.8 1	8.20±0.4 2	8.00±0.47	7.80±0.63	8.20±0.42

Sweet grass juice

It was prepared using red apple, orange and honey, finely ground cinnamon and wheat grass juice. It was liked extremely by the panel. Consistency and overall acceptability was liked very much as well as uniformity was liked moderately by the judges.

Mean score of sensory evaluation of sweet grass juice

Product	Colour	Flavour	Taste	Uniformity	Consistency	Overall acceptability
Sweet grass juice	8.40±0.8 4	8.20±1.0 3	8.20±0.7 8	7.90±0.99	8.20±0.78	8.30±0.82

Orange grass juice

It was prepared using wheat grass juice, orange and carrot. It was liked very much by the judges. Further sensory evaluation reveals that uniformity, consistency and overall acceptability was in the range of “liked very much” by panellists.

Mean score of sensory evaluation of orange grass juice

Product	Colour	Flavour	Taste	Uniformity	Consistency	Overall acceptability
Orange grass juice	8.57±0.05	8.50±0.62	8.50±0.62	8.23±0.80	8.30±0.72	8.57±0.52

Wheat grass lemonade

It was prepared using wheat grass juice, sugar, black salt, roasted jeera powder, lemons, salt, mint leaves. It was also in the category of “liked very much” by all judges. The scores for flavour, taste, uniformity, consistency and overall acceptability were in the category of liked moderately whereas colour was liked very much.

Mean score of sensory evaluation of wheat grass lemonade

Product	Colour	Flavour	Taste	Uniformity	Consistency	Overall acceptability
Wheat grass lemonade	8.00±0.47	7.80±0.42	7.60±0.69	7.70±0.48	7.50±0.70	8.60±0.40

Pineapple wheat grass juice

It was prepared using wheat grass juice, pineapple juice, crushed ice and sugar. It was also found in the range of “liked very much” by panelists. Further perusal of table reveals that scores for colour, flavour, taste and acceptability was liked very much as well as uniformity and consistency were found moderately acceptable by the selected panel members.

Mean score of sensory evaluation of pineapple wheat grass juice

Product	Colour	Flavour	Taste	Uniformity	Consistency	Overall acceptability
Pineapple wheat grass juice	8.00±0.56	8.50±0.62	8.55±0.62	8.30±0.82	8.20±0.68	8.76±0.92

- **Clinical effects of wheat grass on constipation**

General information and dietary intake of subjects suffering from constipation

Table is showing percentage distribution of respondents on the basis of their personal profile.

Information regarding subjects	Number of subjects	Percentage
Age		
18 – 19	12	60
19 - 20	8	40
Caste		
Shedule Caste	1	5
Schedule Tribe	-	-
Other Backward Classes	8	40
General category	11	55
Types of worker		
Sedentary	20	100
Moderate	-	-
Heavy	-	-

The data in above table reveals that age of majority of subjects (60%) subjects were between 18 – 19 years, only 40% were in the age group of 19 -20 years. The perusal of data reveals that majority of the subjects (55%) belonged to general caste, 40% were OBC while only 5% were scheduled caste.

The data further reveals that all the subjects were sedentary worker as they were students and participated less in household or other activities.

Problem of constipation

This sub section deals with the information on problems faced during constipation.

Information regarding problem of constipation

Constipation condition	Number of subjects	Percentage
Duration of constipation		
2 – 3 months	-	-
3- 6 months	6	30
6 -9 months	-	-

9 – 12 months	6	30
1 year or above	8	40
Consistency of stool		
Hard stool	16	80
Semi soft stool	1	5
Soft stool	-	-
Lumpy stool	3	15
Use of hot water for washing		
Yes	-	-
No	20	100
Application of pressure while passing stool		
Yes	18	90
No	2	10
Strained due to bowel movement		
Yes	16	80
No	4	20
Frequency of passing stool		
Once in a day	-	-
Once in two days	17	85
Once in three days	3	15
Problems of flatulence		
Yes	7	35
No	13	65
Anal bleeding		
Yes	7	35
No	13	65
Foul smell from mouth		
Yes	11	55
No	9	45

The perusal of data in table reveals that 40% of subjects were suffering from constipation for more than one year followed by equal percentage of subjects (30%) who were suffering from 3-6 months and 9-12 months respectively.

Majority of the subjects applied pressure while passing stool whereas only 10% of the subjects didn't applied pressure at the time of passing stool. Frequency of passing stool in 85% subjects was once in two days and rest 15% of subjects passed stool once in 3 days. It was observed that 60% of girls had flatulence problems and rest 35% did not face this problem. 35% of the subjects had anal bleeding and rest 65% subjects had no problem of anal bleeding.

50% of the subjects reported that foul smell emanated from their mouth and breathe whereas 45% reported no problem like this.

Lifestyle pattern and health condition

Lifestyle and health	Number of subjects	Percentage
Suffering from disease		
Yes	-	-
No	20	100
Medicine intake		
Yes	2	10
No	18	90
Which medicine		
Pain relieving	1	5
Blood pressure	-	-
Antidepressant	-	-
Iron supplements	1	5
Steroids	-	-
Hormones	-	-
Blood sugar	-	-
Any other	-	-
Undergone any surgery		
Yes	-	-

No	20	100
Exercise		
Yes	-	-
No	20	100
Treatment for constipation		
Home remedy	18	90
Doctor's consult	2	10

All the subjects studied were not suffering from any type of disease. Only 10% of the subjects took medicine (pain relieving and iron tablets) on the onset of problem and had never undergone any surgery. Ninety percent of the subjects never exercised in daily life and took home remedy for constipation, whereas only 10% subjects consulted doctor for treatment of constipation.

Dietary intake of the subjects

Dietary intake of subjects	Number of subjects	Percentage
Preference for meals breakfast		
Yes	6	30
No	14	70
Mid morning		
Yes	14	70
No	6	30
Lunch		
Yes	13	65
No	7	35
Evening tea		
Yes	15	75
No	5	25
Dinner		
Yes	20	100

No	-	-
Fast food consumption		
Yes	19	95
No	1	5
Frequency of consumption		
Daily	14	70
Once in two days	6	30
Once in three days	-	-
Water intake		
0-5 glasses	20	100
5-10 glasses	-	-
Dietary intake		
Cereals		
Yes	20	100
No	-	-
Pulses		
Yes	7	35
No	13	65
Vegetable		
Yes	6	30
No	14	70
Fruit		
Yes	3	15
No	17	85
Fat		
Yes	20	100
No	-	-
Meat		
Yes	-	-
No	-	-
Fish		
Yes	-	-

No	-	-
Milk		
Yes	9	45
No	11	55
Juice		
Yes	2	10
No	18	90
Salad		
Yes	3	15
No	17	85
Papaya		
Yes	-	-
No	20	100
Apple		
Yes	-	-
No	20	100
Banana		
Yes	4	20
No	16	80
Grapes		
Yes	-	-
No	20	80
Watermelon / Muskmelon / Lemon		
Yes	4	20
No	16	80
Mango		
Yes	-	-
No	-	-
Guava		
Yes	3	15
No	17	85

Any other fruit		
Yes	-	-
No	-	-

The data in Table is showing that 70% of the subjects didn't take breakfast, 70% preferred morning meals, 65% took lunch whereas 35 % of girls were not taking lunch in daily routine. However, 75% of respondents preferred taking evening tea, 25% didn't take evening tea and hundred percent of girls consumed dinner daily. The data further revealed that fast food consumption was very high in adolescent girls. Ninety five percent subjects consumed fast foods like samosa, burger, chowmein, maggi, chhola bhatura etc. and the frequency of consumption of fast food was 73.68% daily and rest 26.32 % consumed once in two days. The water intake was very less in all the subjects as they consumed only about five glasses in a day. Hundred percent of the respondents consumed cereals, whereas only 35% of girls consumed pulses in their diet. The vegetable and fruit consumption was also very low among the girls. Only thirty percent of the girls consumed vegetables while 70% girls were not consuming vegetables. Only 155 of the girls consumed fruits and eighty five percent didn't prefer eating fruits in daily routine. Almost half of the subjects were consuming milk and fifty five percent of the girls didn't prefer consuming the milk. The data further concludes that only 10% of girls took juices, rest didn't prefer it. Eighty five percent girls didn't eat salad whereas only 15% of respondents used to eat salad. The fruit consumption was very low in adolescent girls and the preferred fruits were apple, guava, lemon and watermelon.

Thus it can be concluded from the above table that the dietary intake, vegetable and fruit consumption and physical activities of the subjects was not proper. The intake of fibrous products and water intake in diet, fruits were also not appropriate, which could have lead to the problem of constipation.

Effect of wheat grass on the frequency and colour of stool

In an experiment, the selected subjects were administered with 100 ml wheat grass lemonade (wheat grass juice 2 oz = 56 gm = lemon +water). The subjects were given 2 glasses of wheat grass lemonade daily for 2 months. The observations of frequency,

consistency and colour of faecal matter was recorded every 10th day beginning with 0 day. The results of the experiment are discussed below -

Day 0

Frequency: On day zero, 65% of the subjects passed stools once in two days and remaining 35% subjects passed stools once in three days.

Consistency: In case of consistency, on day zero, it was observed that 90% of the subjects passed hard stool and 10% passed semi soft stool.

Colour: Similarly on day zero colour of the stool was also enquired. The data revealed that 40% of the subjects had medium colour, whereas 60% subjects had dark coloured stool.

Day 10

Frequency: On the 10th day of feeding wheat grass juice, improvement in the frequency of faecal matter was observed. Twenty percent of the subjects passed stools once in three days and 80% of the subjects passed stools once in two days.

Consistency: By the 10th day of feeding trial, a light change in the consistency of faecal matter was observed. Though 80% of the subjects passed hard stool but rest 20% of the subjects had semi soft consistency stool.

Colour: Similarly on day 10th, the colour of faeces of 55% subjects was found to be medium, while 45% subjects had dark coloured stool.

Day 20

Frequency: As the feeding trial proceeded to the 20th day, further improvement in the frequency of faecal matter was observed as 30% of subjects passed stool once in a day and rest 70% of the subjects passed stool once in two days. The number of subjects passing stool once in three days declined.

Consistency: By the 20th day, improvement in consistency of passing faeces was also noted. Equal percent of subjects (55%) passed semisoft and hard stool.

Colour: Similarly on day 20th, there was an improvement in colour of faecal matter as 15% of subjects passed faecal matter of light colour, 50% of medium colour and 35% had dark coloured stools.

Day 30

Frequency: By day 30th, it was seen that the frequency pattern of passing stool of the subjects further improved. Sixty five percent subjects passed stool once in two days and rest 35% passed faeces once in a day.

Consistency: in improvement in the consistency of faecal matter was observed as the trial reached its 9th day. Sixty five percent of the subjects passed semi soft faecal matter but still there were 35% of the subjects who passed hard stools.

Colour: The observation on the 30th day revealed a slight more improvement in colour of the faecal matter. As 30% of the subjects passed light coloured stools, 45% of the subjects passed medium coloured and 25% passed dark coloured stool.

Day 40

Frequency: By the 40th day, the subjects were observed to have a desirable pattern of passing faeces. Majority of the subjects (75%) passed stool once in day and only 25% of the subjects passed stools once in two days.

Consistency: Remarkable improvement in the consistency of the faecal matter was also observed. Seventy percent of the subjects passed soft stools and rest 25% of the subjects passed semi soft stools as well as 5% subjects passed hard stools.

Colour: By the end of the 40th day, there was an improvement in the colour of the stool. Half of the subjects (50%) passed light coloured stool, 35% subjects passed medium coloured stool and rest 15% still passed dark coloured stool.

Day 50

Frequency: As the trial proceeded to the 50th day, only 10% of the subjects passed faeces once in two days, where as 90% subjects showed improvement in constipation by passing faeces once in a day.

Consistency: By the end of the trial, on day 50, only 25% of the subjects passed semisoft stools and 75% subjects passed soft stools.

Colour: Similarly by the end of 50th day, a remarkable change in colour of stool was also observed. Only 40% of subjects passed medium coloured stool and 60% of the subjects passed light coloured stool.

Therefore, administration of wheat grass juice for 50 days, all subjects revealed a relief in constipation in terms of frequency, consistency and colour of faeces leading to a relief in the problem of flatulence, discomfort and pain.

As per Tarendra (2008), delayed gastric emptying is responsible for constipation as water is absorbed while the waste is in our body for long time and the stool becomes drier and harder to pass. Regular use of fruit and vegetables make the constipation ailment very ordinary and are easily resolved.

Wheat grass juice is a herbal medicine. Herbalist recommended when suffering from constipation to drink 2 oz of wheat grass twice daily to resolve this problem (Hepzibath, 2008).

Gir et al. (2015) reported positive role of the fermented wheat grass extract (Avemar) in rheumatoid arthritis.

Sethi et al. (2006) also suggested that consumption whole grains has protective role in chronic degenerative diseases like heart disease, diabetes, cancer and constipation.

Conclusion

Wheat also known as *Triticum astivum*, is a cereal grass of the Gramineae family that is an edible grain. It is the world's largest cereal crop. It forms rich source of chlorophyll and abundant vitamin and mineral required for adequate human health. Therefore it is very useful for curing constipation and stomach upset. Wheat grass juice is used to prepare various juice products like wheat grass soda, orange grass juice, sweet fruit and wheat grass juice, pineapple and mix fruit juice, wheat grass lemonade. It is cheap and locally available. It as therapeutic as well as nutritive value which needs storage complaining to create awareness and consciousness among the producers and consumers to popularize this grass.

The study was carried out in Pilani town from where wheat grass was selected purposively for the present investigation. The wheat grass were obtained in the month of June to August at unripe stage organoleptic evaluation of wheat grass juice products was done by

a panel of 10 judges. The present investigation was undertaken to study utilization of wheat added products and their assessment in curing constipation.

Standardization of recipes

The recipes viz, wheat grass soda, orange grass juice, sweet fruit & wheat grass juice, pineapple and mix fruit juice, wheat grass lemonade were evaluated organoleptically on a 9 point hedonic rating scale. All the recipes were in the categories of 'like very much' to 'like moderately'. Five recipes pertaining to wheat grass soda, orange grass juice, sweet fruit and wheat grass juice, pineapple and mix fruit juice, wheat grass lemonade having the highest overall rating scores were selected.

Assessment of clinical effect as wheat grass juice on constipation

The clinical effect of wheat grass juice was studied on 20 subjects suffering from constipation. The subjects were selected from "Shrimati Indramani Mandelia Shiksha Niketan, Pilani". The selection criteria was on the basis of information regarding the problem of constipation, lifestyle pattern and health condition and dietary intake of subjects chosen, 60% of the subjects were in the age group of 19-20 years. Among the selected subjects, 55% were in the general category, 40% were in the category of OBC while 5% subjects were from SC category. Hundred percent of subjects were sedentary worker. The clinical effect of wheat grass juice was studied on chronic constipation. A remarkable improvement was noticed in constipation that proves that wheat grass juice is a good laxative agent. So there is a need to develop various products from wheat grass juice and to create awareness among people about their benefits.

Wheat grass does not contain any harmful substance and as it is very beneficial in many health conditions, therefore it should be included in daily diet to avail maximum advantage of its benefits.

Implications of the study

It can be useful for the people in the community for curing constipation and further work can be carried out for studying the clinical effect of wheat grass juice on various other medical problems.

It can be useful for food industries to prepare these kinds of nutritious alternatives.

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