



WHEATGRASS: AN ALTERNATIVE HOUSEHOLD NUTRITIONAL FOOD SECURITY

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Article Received on: 19/04/12 Revised on: 21/05/12 Approved for publication: 06/06/12

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ABSTRACT

Wheatgrass is an inexpensive and efficient source to provide all the required nutrients and medicinal benefits for a healthy and rejuvenating body. This research work was focused on two objectives. First one was to study the various parameters that would affect the growth of wheatgrass like temperature, humidity and time taken to reach a target height. The second objective was to improve the organoleptic characters and shelf-life of the wheatgrass juice as the currently available wheatgrass products (tablets, powders, etc.) are less popular because of their low organoleptic characters and low storage life. First, Wheatgrass was grown in two trays, one in growth chamber and other in-field conditions and their growth characteristics were compared over a fixed time-period. For improving the flavor and aroma, fresh wheatgrass juice was mixed with various flavors in different dilutions and a survey was conducted among 50 subjects. After that, lyophilisation was carried out to obtain the dried form of wheatgrass juice which provides a higher shelf-life. The results obtained showed that wheatgrass growth in the tray kept in-field took 16 days while the tray in growth chamber took only 10 days to reach the same target height. Moreover, the diluted and flavored forms of the wheatgrass juice were found to offer an acceptable organoleptic profile including taste, color and aroma. Lyophilized form of wheatgrass retained the organoleptic characters and provided it a longer storage life. All these results will formulate a more acceptable form of wheatgrass product and are likely to increase its popularity.

Keywords: lyophilisation, organoleptic characters, shelf-life, wheatgrass.

INTRODUCTION

In the developing countries, many low-income families relies on a simple diet which mainly consist of staple food crops such as wheat, maize and rice that are poor sources of various nutrients and minerals. To provide a wholesome nutrition for a healthy and rejuvenating body, green foods could be very useful in providing nutrients like vitamin, proteins, minerals and antioxidants which are researched for numerous health benefits in USA, East Asian countries and Central Europe¹⁻³. Cereal grasses (young shoots of grain-bearing plants) including alfalfa, barley grass, wheatgrass are one such type of Green foods which are very beneficial for a healthy body. In Asia and Europe, wheatgrass and wheatgrass based products are consumed in the form of juices, powders and extracts for healthy growth of human body although limited scientific literature is available.

Wheatgrass is grown from the cotyledons of the common wheat plant, *Triticum aestivum*. Wheatgrass has been identified as a complete food providing all the nutrients than provided by any other foods. It is reported that "fifteen pounds of wheatgrass is equal in overall nutritional value to 350 pounds of ordinary garden vegetables"⁴, as it contains various essential and non-essential amino acids, vitamins, minerals, chlorophyll, and enzymes.

Wheatgrass juice also provides multiple health and wellness benefits for the human like in resolving digestion related problems, anemia, purifying blood, strengthening immune system, etc. Wheatgrass juice also proved to have some anti-carcinogenic activity but the exact reasons were not correctly reported anywhere. A very few publications are reported in scientific literature on nutritive and antioxidant properties of wheat sprout extracts where it is reported that these extracts inhibit the DNA oxidative damage and effective in suppressing superoxide radical that can further lead to various diseases⁵. Wheats (*Triticum aestivum*) have been known to possess antimutagenicity⁶ and antioxidative activity because of redox enzymes including catalase,

peroxidase and other antioxidant compounds such as phenolic acids, alkyresorcinols, and aminophenols⁷.

Wheatgrass was also reported to be helpful in curing certain diseases such as thalassemia⁸ & distal ulcerative colitis⁹. In a study, breast cancer patients who drank wheatgrass juice daily showed a decreased need for blood- and bone marrow-building medications during chemotherapy, without diminishing the effects of the therapy¹⁰. The food has also demonstrated in vitro cytotoxicity to Human promyelocytic leukemia cells¹¹.

At present, the wheatgrass is available in the form of products such as health supplements (powders, extracts) and medicines (tablets). These are not so much popular since they are consumed only by people in poor health conditions, thus contributing to lack of its wide acceptance. Moreover, the factors like stringent growing conditions for good quality wheatgrass, low organoleptic characters like taste, aroma and color, and poor shelf-life of wheatgrass products underweight its wide acceptance among the consumers. In India, only few outlets are present which sell wheatgrass drinks, and that too at very high prices. To overcome all these problems and to make wheatgrass juice widely acceptable, this research work has been carried out.

The main objectives of the study were:

- 1.) To identify and optimize the important parameters for wheatgrass growth and
- 2.) To improve the organoleptic characters (taste, aroma and color) and shelf-life of the wheatgrass juice.

MATERIALS AND METHODS

Plant Material

For growing wheatgrass, 250 grams of wheat seeds and rectangular trays were bought from Vellore local market (India). Red soil and cow dung manure were collected from local plant house of VIT University, Vellore, India. Wheat seeds were rinsed with tap water 3-4 times prior to soaking. After rinsing, seeds were soaked in water mixed with

1tablespoon of baking powder for 15 hours. Draining of seed was carried out for duration of 15 hours after which the seeds were found to be sprouted. Wheatgrass trays were prepared using red soil and cow dung manure mixed in a ratio of 2:1. Sprouted seeds were evenly spread over the soil in both the trays preventing there the overlapping and increasing proximity between the seeds.

General

For comparative growth studies, one tray (tray 1) was placed in a growth chamber maintained at 21/18 °C and relative humidity of 40-46 % while the other(tray 2) was kept in field conditions at a temperature of 32-35 °C and a relative humidity of 65%. After a little growth in height, the trays were transferred to a relatively warmer place with indirect sunlight and proper air circulation conditions for the development of green color. Some days later, when the wheatgrass reached to a height above 7", they were harvested and immediately stored in a refrigerator. Later, the wheatgrass juice was extracted by cold extraction procedure using water. Next, the wheatgrass juice centrifuged and filtered to remove the suspended matters and mixed with different flavors such as orange, mango, apple, pineapple, lemon, sugarcane in different proportions and combinations. A survey was conducted among 50 young people in the age group of 17-25 years to test the flavor and aroma of the drink and their feedbacks on the different samples were analyzed.

The two wheatgrass samples mixed with mango and sugarcane juice were taken and further added with 4ml of pomegranate and beetroot juice in either of them and subjected for lyophilisation (VIT University, Vellore, India). The samples were taken in 20 vials with 1ml for each sample and froze for 36 hours and then subjected for lyophilisation working on a range of -80 to -20 °C.

RESULTS

As illustrated from Fig.1, Wheatgrass took 11 days to gain a height of 7" in tray1 while for tray2 it took 16 days. Little growth was observed in the incubator but a good growth was observed when prevailing environmental conditions were further provided. Thus, variation in growth could be seen with changing conditions and four environmental parameters were considered important for the growth of wheatgrass, namely temperature, humidity, air circulation and time taken to reach a target height. It was observed that tray1 with less number of dispersed seeds showed an efficient growth of wheatgrass than tray2 with more number of seeds. There was no fungus observed in both of the trays. After the wheatgrass attained a height up to 7 inches along with forking, the wheatgrass was ready for harvesting as nutrients were at peak at this stage.

The diluted wheatgrass juice was mixed in different proportions with mango (2:1, 4:1, 6:1 and 9:1), orange (6:1, 9:1) and lemon (6:1, 9:1) flavors. The survey among 50 young individuals and their responses towards the flavor of different samples were illustrated in Fig. 1 & 2.

The inference from the Fig. 1 was that the mango flavor mixed at highest dilutions (9:1) was most preferred for consumption by the volunteers while the less diluted forms were only tolerable. From the Fig. 2, it could be inferred that the lemon flavor was more preferable than the orange flavor, even though both mixed at the same proportions.

Various flavors (lemon, apple, pineapple, sugarcane and orange) in different combinations were mixed with wheatgrass juice. A total of 8 combinations were made, 4 with sugar and the other 4 with no sugar. A survey was conducted with same 50 individuals to test palatability of the samples. The results were presented in Fig.4.

As illustrated by Fig.4, the combinations with sugar were more preferable among volunteers rather the combinations with no sugar. Orange and sugarcane juices in combination with sugar and wheatgrass juice were more preferred than other flavors. Apple flavor was least preferable among all the flavors.

DISCUSSION

Plant based food and food products are the major source of nutrients such as carbohydrates, proteins, amino acids, lipids and dietary fiber along with essential elements. One of such main source is wheatgrass and its juice which is consumed for healthy growth of human body.

The result of this research work done could be useful to make wheatgrass and its products more popular and acceptable by the consumers. Wheatgrass products could be used to eradicate the malnutrition problems from developing and under developed countries like India and Sudan respectively, as it is an inexpensive and complete source of nutrition. The raw material is cheap and available throughout the year. Furthermore, an idea could be implemented in future to introduce wheatgrass as a health drink. The idea is to process the health drink in a crystallized form which would ensure for longer shelf-life. The crystallized forms could be reconstituted using whey, soda or simply water, thus reinforcing the flavor. Moreover, crystallized form will not capture the moisture as the powder form faces the problem.

The health drink can be made available at low prices, thus reducing the dependency on vegetables and pulses. Large scale manufacturing of the wheatgrass health drink and the support of the government can help to eradicate the malnutrition problems from the rural India and other parts of the world. Government can provide this health drink in the form of subsidiary to the rural areas especially as a substitute of midday meals. This will cut down the pressure on nutritional security faced worldwide today and mainly in our country.

CONCLUSION

Wheatgrass was successfully grown in growth chamber and in field conditions. Temperature of 18 to 26 °C and a relative humidity of 40 to 50% were found to be suitable for the growth of wheatgrass. Indirect and low air circulation is needed to prevent the lodging of wheatgrass. Increasing the distance between seeds could prevent easily the growth of molds rather than adding baking powder during watering.

Wheatgrass juice was mixed with different flavors and it provided an improved taste and color than provided by the concentrated form of wheatgrass juice. No health issues were reported by the volunteers who took part in the survey. Increase shelf life will give the transport of product to remote areas and their storage for a longer period than the original fresh product. Our next target is to study the anti-carcinogenicity of wheatgrass and to analyze how potent this medicinal plant could be in comparison to commercially available cancer drugs like vinblastine and vincristine.

ACKNOWLEDGEMENT

The authors are very much thankful to the Director of School of Bio-Sciences and Technology, VIT University, Vellore, for allowing us to use the facilities for this research work. The authors would also like to thank all the volunteers who helped in the survey.

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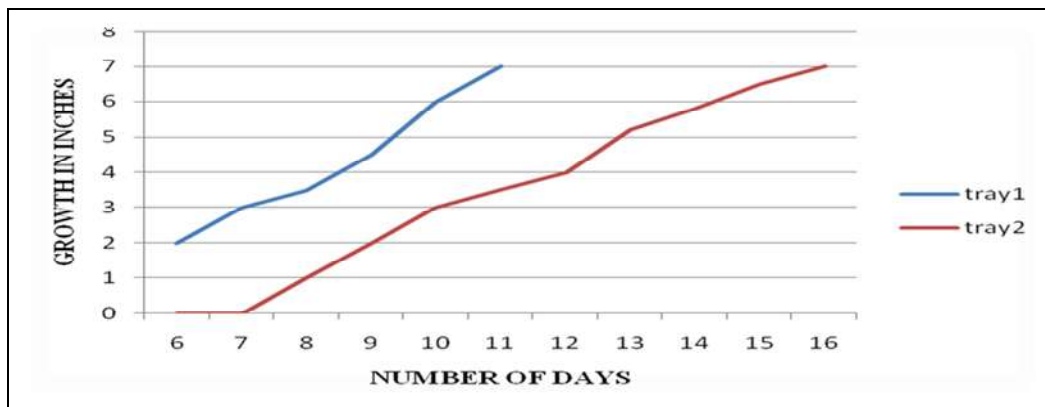


Fig.1: Wheatgrass growth curve. Curve above shows the difference in growth patterns of 2 trays. Tray 1 was kept in growth chamber while tray 2 was kept in field environment

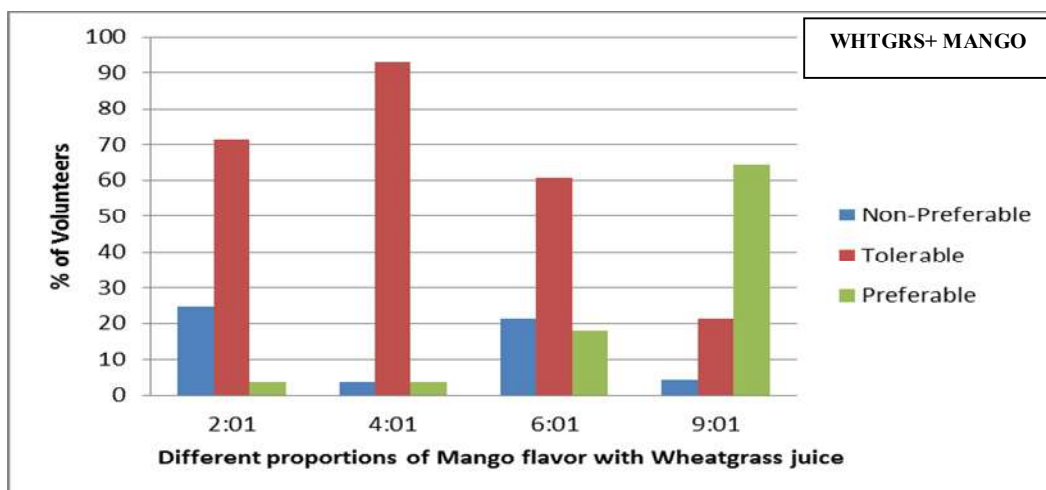


Fig.2: Preference of volunteers for mango flavor mixed with wheatgrass juice.

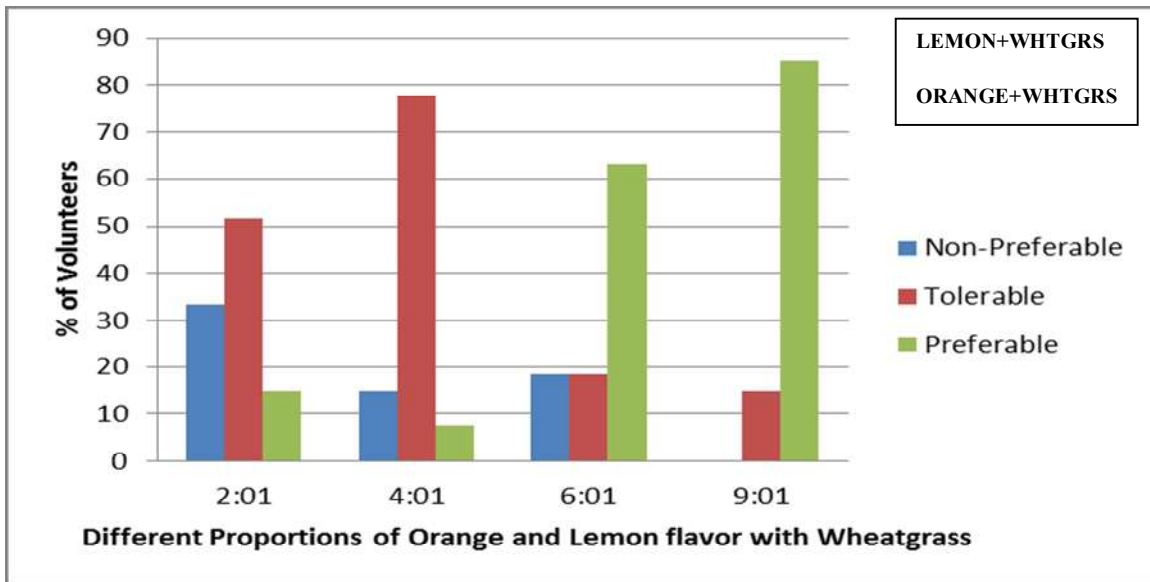
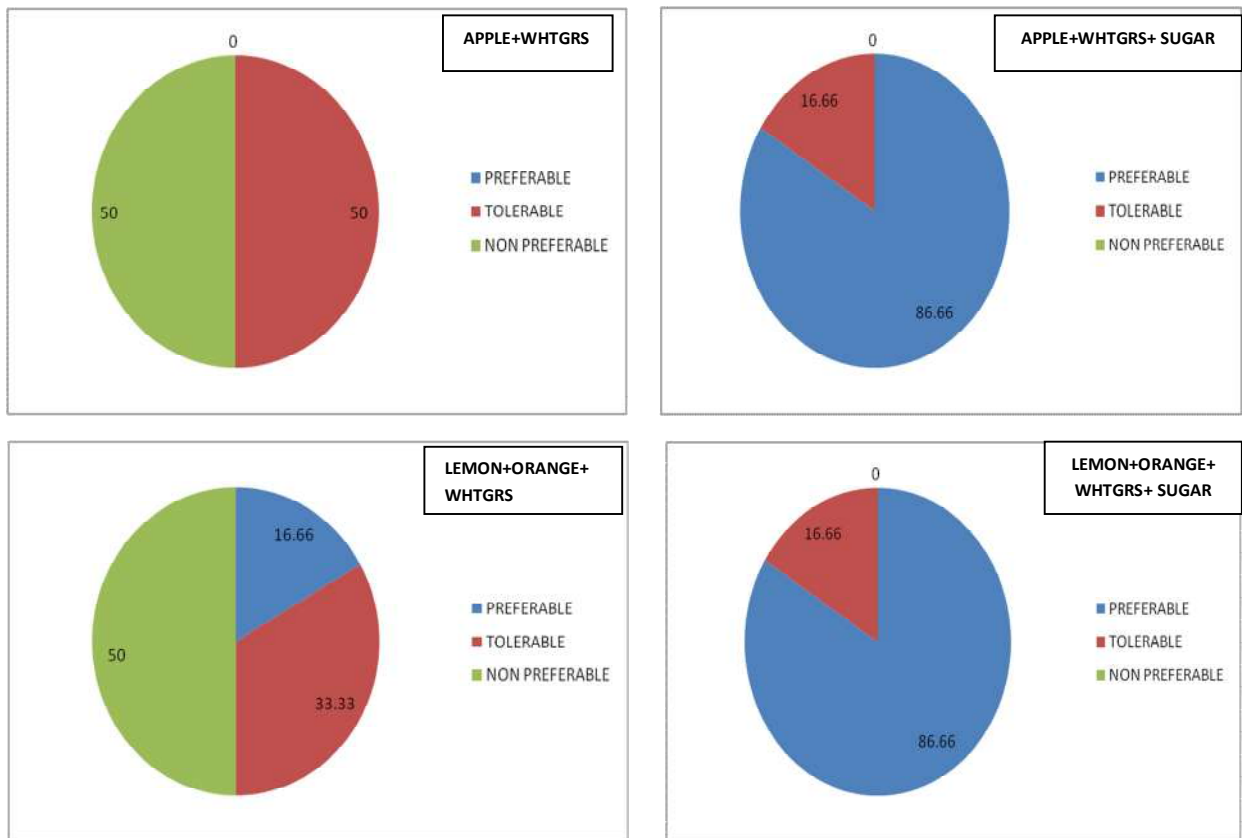


Fig.3: Preference of volunteers for orange and lemon flavors mixed with wheatgrass juice.



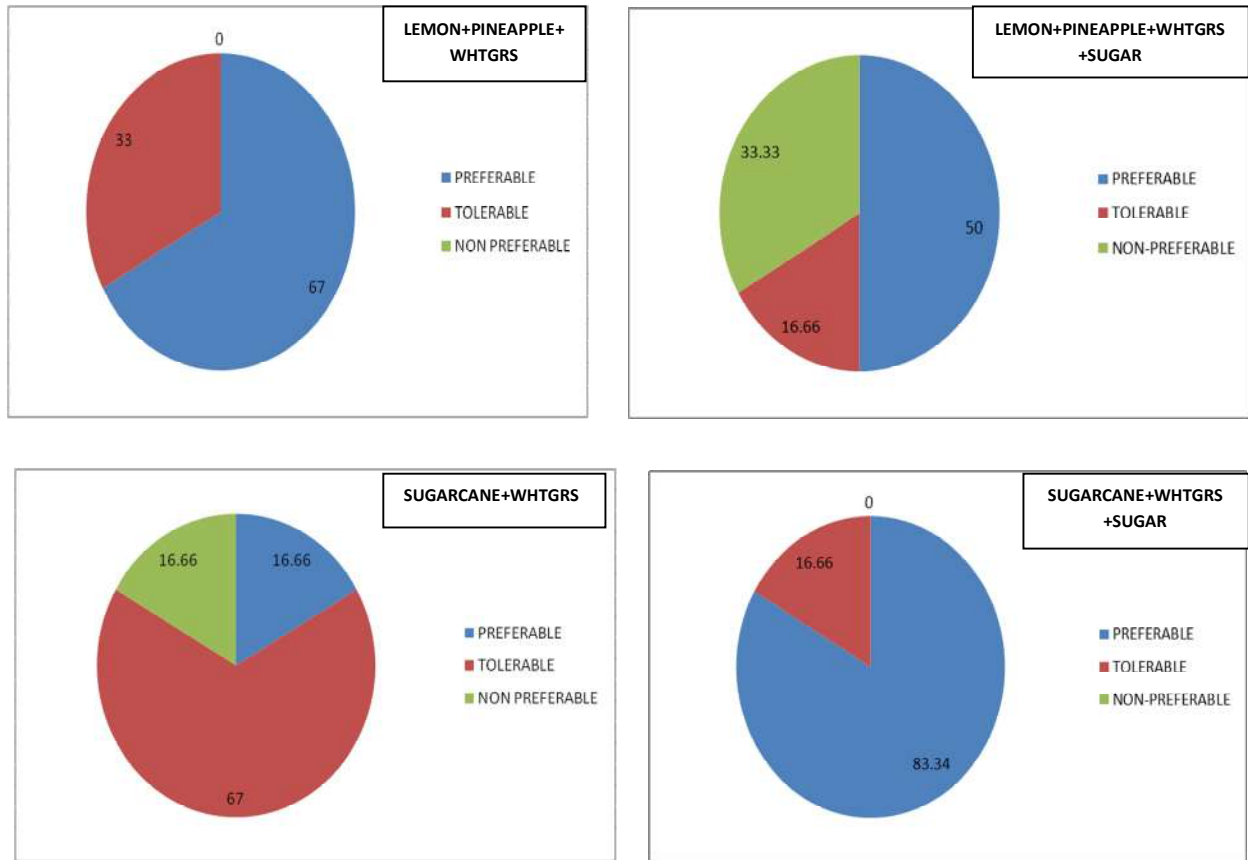


Fig.4: Preference of volunteers towards different combinations of flavors and wheatgrass.

Source of support: Nil, Conflict of interest: None Declared