American Journal of Food Technology

ISSN 1557-4571

Academic Journals Inc.

www.academicjournals.com

American Journal of Food Technology 7 (9): 571-576, 2012
ISSN 1557-4571 / DOI: 10.3923/ajft.2012.571.576

Development of Health Drink Enriched with Processed Garden-cress (*Lepidium sativum* L.) Seeds

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ABSTRACT

The main objective of this study was to make a formulation which can be easily taken by the consumer. Therefore, it was decided to make a health drink, keeping in view the varied need of different consumers. Garden cress (*Lepidium sativum*) belongs to family Cruciferae and is grown in India, North America and parts of Europe. The edible whole seed is known to have health promoting properties hence, it was assumed that these seeds can serve as raw material for functional foods, sharing its peppery, tangy flavor and aroma. Since, it is rich in proteins, carbohydrates and certain essential minerals like calcium, iron and phosphorous along with crude dietary fiber (7.6%) it can be used as health drink with milk as its base. An attempt has been made by adding 5% sugar (w/v) in skimmed milk with 1% fat and different quantity of washed, boiled and powdered seeds of garden cress along with sodium salt of Carboxymethyl Cellulose (CMC) as suspending agent. The drink that was found most suitable, with an overall consumer acceptability of 8.75 was that containing 3% of the seed powder.

Key words: Cruciferae, garden cress, proteins, carbohydrates, health-drink

INTRODUCTION

Garden cress (*Lepidium sativum*) belongs to family Cruciferae grown in India, North America and parts of Europe. The edible whole seed is known to have health promoting properties as it contains 25-39% of protein. Thirty three percent carbohydrate, 2.4% crude fat, 7.6% crude fiber and 6.4% minerals having 0.723% phosphorous and hence it was assumed that these seed can serve as raw material for functional foods (Patel *et al*., 2009; Fekadu *et al*., 2002), sharing its peppery, tangy flavor and aroma (Roy *et al*., 2002). It is also known as common cress, land cress and Haliv in India (Gokavi *et al*., 2004).

L. sativum seeds were largely used for the treatment of hypertension and renal disease (Jouad *et al*., 2001). It is also used as a laxative for gastrointestinal disorders, prevention of cancers since it has the ability to trap free-radicals, as memory boosters as it contains essential fatty acids like erucic acid, arachidic and linoleic acids, to control mild glycemia in diabetic patients as it is a rich source of a phytochemical called lepidimoide which prevents reabsorption of glucose from the renal system back in the blood (Eddouks and Maghrani, 2008). Since, it is a good source of calcium it often helps in normal contraction of muscle for healthy movements of limbs and heart

(Gopalan *et al*., 2004). Iron content in the seed powder often helps to cure mild anaemic conditions, especially in children. Phosphorus, of course, is needed for general healthy metabolic activities of the body. Certain authors have also reported that the seed of *L. sativum* helps to speed up the recovery of fractured bones (Abdulliah-Juma, 2007), reduce hair loss and premature graying of hair, etc.

Certain scientists thought that if the seeds are so medicinal in their contents, the sprouts from the seeds should be a still better source of all the medicinal properties mentioned above, this led to development of cultivation practices for the plants on a large scale in Europe. It was found that for maximum and healthy sprouting of the *L. sativum* seeds selenium is an essential elements that must be provided during germination (Frias *et al*., 2010). However, with passage of time it was seen that such a practice was not economically feasible. Another important observation that was recorded by Camilla *et al*. (2008) was that seed powder helps in building up of mass of lean muscles in the body and this was very attractive to those who wanted to build muscles but without the fat in it. It is well known that the best way to do so is by consuming whey proteins and not milk (Camilla *et al*., 2008). Therefore, it was decided to supplement whey protein concentrates with the powder of the seeds of *L. sativum*. However, due to very poor consumer acceptability, such an idea remained only of academic interest.

Further studies on the seed contents revealed that the seeds are a rich source of omega 3-fatty acids which helps to lower cholesterol in hyper cholesterolemic patients (Golay *et al*., 1990). This was an extrapolated postulation from the animal studies conducted in cattle. However, as of date it is still believed that if it is possible to consume regularly, at least on a daily basis, certain quantum of the seeds of *L. sativum* in some form or the other, it could go a long way in reducing the health risks associated with hypercholesterolemia.

Keeping all these reports in view, it was decided to try and make a health drink using the seed powders in skimmed milk as the base.

MATERIALS AND METHODS

Materials: Garden cress seed powder, skim milk, sugar sodium CMC were purchased from local market. Analytical grade of chemical were used for the chemical analysis and which were supplied by local supplier. The seeds were analyzed chemically for moisture, protein content, crude fat content, crude fiber content (Opitz *et al*., 1998), ash content and then iron, calcium and phosphorous content (Ranganna, 1986).

Processing of garden cress seeds: Garden cress seed were obtained from the market which was washed with potable water. The seeds were then boiled in excess of potable water for 15 min at 95°C. These were then cooled to room temperature and then the excess water was drained off. The boiled seeds were washed six times with excess of potable water, each time draining off the excess water. Finally the washed seeds were dried in a tray drier at 40°C for 10-14 h. The dried seeds were ground to powder of -100 mesh size and were stored in tightly capped glass bottles. This was also subjected to the chemical analysis as mentioned above.

Preparation of health drinks using the processed seeds: Different types of health drinks were prepared in skimmed milk, as shown in Table 1. Here the quantity of the seed powders was varied from 1-5% (w/v). The quantity of sodium CMC also varied to keep the powder in suspended form and not allow it to precipitate. The specific gravity of the drink samples and their viscosity were also estimated (Ranganna, 1986).

Table 1: Different health drinks prepared varying the quantity of garden cress seed powder

Health drink samples	Milk (mL)	Sugar (g)	Garden cress powder (g/100 mL)	Sodium CMC (g)
A	100	5	1	0.0
B	100	5	2	0.01
C	100	5	3	0.02
D	100	5	4	0.04
E	100	5	5	0.06

Sodium CMC: Sodium salt of carboxymethyl cellulose

Data analysis: The sensory analysis was carried out on a 9 point Hedonic scale, to find the consumer acceptability. Maximum score of 9 was meant for maximum consumer acceptability and minimum score of 1 was indicative of total non-acceptability by the consumer. Based on the results health drink 'C' was selected for further studies.

RESULTS AND DISCUSSION

One of the most important things that were kept in view was the consumer acceptability of the final product. The product should aid in filling up the deficiencies in the health of the consumer and also help those who are building lean muscles by doing exercise. In both the cases the final product must have a minimum quantity of the seed powder to carry out the desired function.

It can be seen from Table 2, that there was slight lowering of contents of certain parameters of processed seeds like ash content, and iron content and significant lowering in the carbohydrate content and calcium content. However, on the other hand there was significant increase in phosphorous and energy content of the processed seeds. This is in agreement with the finding of Gopalan *et al.* (2004).

The organoleptic evaluation of the different heath drinks prepared using different amounts of processed garden-cress seed powder, was thought to be the best method of judging the consumer acceptability of product. The assessment was done by studying the characteristics like flavor, color, palatability, mouth feel (consistency) and overall acceptability of health drink and result are presented in Table 3. The organoleptic evaluations showed that the sample prepared with supplementation of garden-cress seed powder at 3% (w/v) had highest overall acceptability.

Table 4 shows that when health drink 'C' was analyzed physicochemically, it had different characteristics which must have been from the skimmed milk used as base of the drink.

This finding is essential as skimmed milk containing 1% fat and 8.5% solids non-fat, has a mouth-feel depending on these 2 important parameters like specific gravity and viscosity.

It can be seen from Table 5 that the specific gravity of drink is very close to that of pure milk, with viscosity being directly proportional to the temperature.

The health drink is actually a fortified functional food, ideally suited for growing children, the aged and the invalids and also certain convalescent patients. It increases the nutritional values of milk, providing all the essential factors needed by these people. However, it also has an important application and that is helping to build up the lean muscles (Camilla *et al.*, 2008) for those who are health conscious and do a lot of exercise in that direction. The findings support this view and would go a long way in helping to develop the food. It may not be a good idea to supplement whey solids (which these people consume) but definitely would help if used to fortify or supplement skimmed milk with fat content around 1%. Again if the chemical analysis of the processed seeds

Table 2: Physicochemical analysis of raw and processed garden cress seeds

Parameters	Raw and fresh seeds	Processed seeds
Moisture (%)	92.00	3.65
Protein (%)	2.50	31.25
Crude fat (%)	0.10	37.20
Ash (%)	0.70	5.70
Carbohydrate (%)	9.60	7.00
Crude fibre (%)	12.00	16.66
Calcium (mg/100 g)	0.20	240.00
Iron (mg/100 g)	90.00	90.00
Phosphorous (mg/100 g)	49.00	540.00
Energy (kcal/100 g)	92.00	523.80

Table 3: Sensory analysis of all the health drink samples

	Parameters				
Sample code	Color	Flavor	Palatability	Consistency	Overall acceptability
A	7.50	7.62	7.87	8.07	8.00
B	8.50	7.87	8.12	8.50	8.75
C	8.50	8.50	8.37	8.50	8.98
D	7.40	7.20	7.00	4.00	7.50
E	6.60	7.00	6.00	6.00	6.50
F	6.00	6.00	5.00	5.00	5.80

The above scores are given on a scale of 10 where 1 is the lowest value indicating non-acceptability and 10 would be the highest value (which would be very rare)

Table 4: Physicochemical analysis of health drink 'C'

Parameters	Health drink 'C'
Moisture (%)	84.10
Protein (%)	3.44
Crude fat (%)	1.22
Ash (%)	0.85
Carbohydrate (%)	10.30
Calcium (mg/100 g)	127.20
Iron (mg/100 g)	2.90
Phosphorous (mg/100 g)	106.20
Energy (kcal/100 g)	65.63

This data is important when one examines the same parameters of raw seeds from Table 2

Table 5: Specific gravity and viscosity of the health drink 'C'

Parameters	Sample C
Specific gravity (at 25°C)	1.022
Viscosity (cP) at	
45°C	4.20
40°C	4.90
35°C	5.58
30°C	7.74
25°C	8.48

(Table 2) and that of the drink (Table 4) is examined closely, then it can be seen that the nonheme iron which is actually very low in milk (1 mg/100 mL maximum) is raised to 2.9 mg/100 mL. The

major advantage is that, though cow's milk is low in iron but has an absorption capacity of 48% (mean value) with around ±25.5% (SD) (Hallberg *et al.*, 1992). It is very essential for humans to get that extra iron. The viscosity of the drink comes primarily from the carbohydrates present in the garden-cress seed which tends to swell during boiling and soaking in water. Actually the sprouts of the seeds are usually consumed as these give a peppery/ gingery flavor to soups. The plant is closely related to water cress and mustard. Previously the functional food property of the garden-cress seeds have been reported (Gokavi *et al.*, 2004), but this is for the first time a functional food has been prepared and tested for its consumer acceptability. Till date the sprouts of garden-cress have been used primarily to add flavor to simple soups and in return get the health benefits (Frias *et al.*, 2010).

CONCLUSION

If one examines the type of consumers who would be having this food, then it can be seen that these consumers can be broadly categorized in two important categories. One is those who are suffering from deficiency of certain nutrients (especially certain essential minerals) due to several reasons like physical strain or convalescing from certain ailments and the other would be those who are doing regular exercise to build up lean muscles. Therefore, it is essential that the food prepared in such a way meets the requirement of these consumers. At the same time it should appeal to the senses of the consumers by having pleasant organoleptic qualities. Keeping this in mind, an attempt has been made to design such a food would be best a beverage which then can be made to not only have the sensory qualities of the consumers but deliver the desired functions as mentioned above.

ACKNOWLEDGMENT

The authors are grateful to the Department of Food Science and Technology, Shivaji University, Kolhapur, for providing the necessary guidance and laboratory facilities to complete the project.

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