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Studies on shelf life of developed flavored milk drink incorporated with wheatgrass juice

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Abstract

The study was conducted to evaluate the shelf life of wheat grass juice incorporated flavoured milk drink (WGJMD). The control product was prepared with sugar (6%) and rose flavor, and WGJMD was prepared with incorporation of wheatgrass juice at 12:1 ratio (milk: wheatgrass juice) in double toned milk followed by sterilization with autoclave and cooling. The control and WGJMD were stored at refrigeration temperature (4 ± 1 °C) and subjected to evaluate the physico-chemical and sensory quality characteristics. However, incorporation of wheat grass juice significantly ($P<0.05$) increased the chlorophyll content but did not affect the pH and titratable acidity. The sensory scores for colour and appearance, flavor and overall acceptability including consistency of developed product were significantly ($P<0.05$) lower as compared to control samples, but WGJMD samples were very well acceptable having more than 7.00 (liked very much) acceptability scores. Storage period did not affect significantly ($P<0.05$) the quality characteristics and sensory scores till 15 days of storage. It is concluded that healthy flavored milk drink prepared with incorporation of wheat grass juice (milk: juice, 12: 1) in double toned milk can be stored up to 15 days with good quality characteristic and highly acceptable sensory scores.

Keywords: wheat grass juice, double toned, flavoured milk, shelf life

Introduction

Over the last decade, demand for “healthy” foods and beverages has increased in many parts of the world (Ozen and others 2012) [1]. Flavoured milk is becoming an integral part of market milk industry because it has good consumer acceptance as a refreshing and nourishing milk beverage. The manufacture of flavoured milk offer dietary advantage. Milk in its natural form is not considered suitable for those people suffering from heart ailments. Infant and sick persons also cannot properly digest full fat milk. All these problems can be solved by manufacturing low fat flavoured milk incorporated with herbal plants (Singh *et al.*, 2005) [2]. The Herbal milk represents a great in between meal and medicine.

Wheat grass juice can be used in the manufacturing of flavoured milk because of its unique nutritional value. It is richest source of chlorophyll, active enzymes, vitamin A, B, C, E and K, calcium, potassium, iron, magnesium, sodium, sulphur and at least seventeen amino acids (Walters, 1992) [3]. The presence of 70 per cent chlorophyll, which is almost chemically identical to haemoglobin and because of this wheatgrass is called 'Green Blood' (Ferruzzi and Blakeslee, 2007) [4].

Chlorophyll present in wheatgrass can protect from carcinogens, it strengthens the cells, increases the function of heart, detoxifies the liver and blood stream, and chemically neutralizes the polluting elements (Kelentei *et al.*, 1958) [5]. Wheatgrass has been claimed to reduce the blood pressure as it enhances the capillaries, supporting the growth of lactobacilli (Locniskar, 1988) [6].

One of the important basic indicators for the quality of milk and dairy products is its shelf life. Pasteurized milk has a shelf life of 10-14 days (Havranekand and Hadtiosmanović, 1996) [7]. It has been consider necessary to point out that the shelf life of dairy products is one of the basic parameters of quality for successful acceptance on the market.

Material and Methods

Wheatgrass of about 7-8 inches height was harvested and hand-washed in tap water 2-3 times and blanched in boiling distilled water and spread on filter paper. Fresh wheatgrass juice was extracted and filtrated through a muslin cloth as the procedure followed by Marwaha *et al.* (2004) [8].

Buffalo milk was obtained from Experimental Dairy Plant of the department of LPT, LUVAS, Hisar, and was standardized as double toned milk with 1.5 percent fat and 9 per cent solid not fat. Sugar and flavours (vanilla/ rose) was procured from local market.

Preparation of Flavoured Milk Drink

The control product was prepared with the addition of sugar (6%) and flavour (*rose*) and developed wheat grass juice milk drink (WGJMD) was prepared with incorporation of wheatgrass juice in double toned milk at 12:1 ratio (milk: wheatgrass juice) followed by sterilization with autoclave and cooling.

The control and developed wheat grass juice milk drink were stored at refrigeration temperature (4 ± 1 °C) and subjected to evaluate the pH value and titratable acidity (% lactic acid) as per AOAC (2002) [9], Chlorophyll (mg/lit) as per Arnon method (1949) [10] and sensory evaluation using 9 point

hedonic scale during storage at an interval of three days.

Data obtained were subjected to statistical analysis using Duncans Multiple Range Test by using SPSS software for finding out the significant difference in the mean values (Steel *et al.*, 1997) [11].

Results and Discussion

Physico-Chemical Properties

There was no significant ($p \leq 0.05$) differences was noticed in pH value with regard to the treatments as well as storage interval (Table 1). However, the pH value of developed flavoured milk juice was slightly higher than control. This was due to incorporation of wheatgrass juice as also reported by Dalim *et al.* (2012) [12]. The pH value showed the slight downward trend in both control and treated products throughout the storage period. Dalim *et al.* (2012) [12] also documented the similar reports with addition of chikoo and banana in milk beverage.

Table 5: Physico-chemical analysis of autoclaved wheatgrass juice added milk drink. Storage period (n=9)

(Days)	pH		Titratable acidity (% lactic acid)		Chlorophyll(mg/lit)	
	C	WGJMD	C	WGJMD	C	WGJMD
0	6.73 \pm 0.010	6.77 \pm 0.013	0.14 \pm 0.006	0.16 \pm 0.002	0.00 ^a	4.83 ^b \pm 0.021
3	6.73 \pm 0.008	6.77 \pm 0.010	0.14 \pm 0.004	0.16 \pm 0.003	0.00 ^a	4.84 ^b \pm 0.043
6	6.72 \pm 0.013	6.76 \pm 0.013	0.14 \pm 0.006	0.17 \pm 0.006	0.00 ^a	4.83 ^b \pm 0.046
9	6.72 \pm 0.009	6.76 \pm 0.010	0.15 \pm 0.005	0.17 \pm 0.006	0.00 ^a	4.82 ^b \pm 0.021
12	6.71 \pm 0.012	6.75 \pm 0.010	0.15 \pm 0.004	0.18 \pm 0.006	0.00 ^a	4.78 ^b \pm 0.052
15	6.71 \pm 0.011	6.75 \pm 0.008	0.15 \pm 0.004	0.18 \pm 0.006	0.00 ^a	4.82 ^b \pm 0.042

Means \pm SE bearing different superscript in a row differ significantly ($P < 0.05$).

C=Control, WGJMD=Wheat grass juice milk drink

Titratable acidity of a food system is indicative of the total acid concentration within a food and it is a better predictor of an acid's impact on flavour than pH. The ability of microorganisms to grow in a specific food is dependent on the hydroxonium ion concentration of the food system (Nielsen, 1998) [13]. Titratable acidity of developed WGJMD was slightly higher than control and it might be due to incorporation of wheatgrass juice. Similar results were also reported by Jayalalitha *et al.* (2012) [14] in sterilized biobeverage milk drink containing dates extract, carrot and beetroot juice. Palthur *et al.* (2014) [15] also reported increase in pH and titratable acidity of prepared *Ocimum sanctum* flavoured herbal milk by addition of tulasi extract with milk. The titratable acidity showed the slight increasing trend in both control and treated products throughout the storage period. These results are in line with the findings of Caro *et al.* (2004) [16] who observed the increasing trend in acidity during storage of *Palazzelli mandarin* for 12 days.

Chlorophyll content of developed fresh milk drink was around 4.84 mg/lit, whereas control had not detected any chlorophyll content. No significant ($p \leq 0.05$) difference was noticed throughout the storage period in chlorophyll content of WGJMD. However, during storage the chlorophyll content of treated milk drink was slightly declined from fresh wheatgrass juice chlorophyll content, this was due to autoclave treatment given to developed milk drink. These results are in agreement with those reported by Vongsawasdi *et al.* (2010) [17] who reported that chlorophyll content of *pandanus* juice decreased as temperature and time increased and due to degradation of

chlorophyll juice colour evidently changed from bright green to dull olive green.

Sensory Evaluation

Sensory evaluation of the products was carried up to 15 days of refrigerated storage at 3 days interval period. However, the sensory scores for flavor, colour and appearance, overall acceptability including consistency of developed product were significantly ($P < 0.05$) lower as compared to control samples, but the products were very well acceptable having more than 7.00 (liked very much) acceptability scores. This might be due to bright/dark green colour, slightly characteristic aroma and acrid taste of wheatgrass juice as compared to control (Ashok, 2011) [18]. Drewnowski and Carmen (2000) [19] also reported that wheatgrass juice contributes bitterness and it could be the reason for low acceptability of wheatgrass juice. Consistency attribute might be maintained due to higher moisture content of wheatgrass juice.

All the sensory scores decreased as the storage period increased but the affect was not significant ($p \leq 0.05$) statistically. These finding about sensory parameters were in accordance with Gonzalez and Leeson (2000) [20] who found that the difference in color of fruit beverage was due to the browning reaction between reducing sugars and amino acids during storage. The slight loss of flavour, taste and overall acceptability may be due to the degradation of ascorbic acid and furfural production during storage as described by Perez and Sanz (2001) [21].

Table 6: Sensory score of wheatgrass juice incorporated milk drink during storage at refrigeration temperature n=12

Days	Flavour		Consistency		Colour and Appearance		Overall acceptability	
	C	WGJMD	C	WGJMD	C	WGJMD	C	WGJMD
0	8.4 ^{aa} ±0.14	7.91 ^{ba} ±0.14	8.33 ^{aa} ±0.14	7.66 ^{ba} ±0.14	8.16 ^{aa} ±0.16	7.58 ^{ba} ±0.14	8.33 ^{aa} ±0.14	7.75 ^{ba} ±0.13
3	8.4 ^{aa} ±0.14	7.91 ^{ba} ±0.14	8.25 ^{aa} ±0.13	7.66 ^{ba} ±0.14	8.16 ^{aa} ±0.16	7.58 ^{ba} ±0.14	8.25 ^{aa} ±0.13	7.75 ^{ba} ±0.13
6	8.33 ^{aa} ±0.14	7.83 ^{ba} ±0.11	8.25 ^{aa} ±0.13	7.58 ^{ba} ±0.14	8.08 ^{aa} ±0.08	7.50 ^{ba} ±0.15	8.25 ^{aa} ±0.13	7.66 ^{ba} ±0.14
9	8.33 ^{aa} ±0.14	7.83 ^{ba} ±0.11	8.16 ^{aa} ±0.11	7.58 ^{ba} ±0.14	8.00 ^{aa} ±0.12	7.41 ^{ba} ±0.14	8.16 ^{aa} ±0.16	7.66 ^{ba} ±0.14
12	8.25 ^{aa} ±0.13	7.75 ^{ba} ±0.13	8.16 ^{aa} ±0.16	7.50 ^{ba} ±0.15	7.91 ^{aa} ±0.14	7.41 ^{ba} ±0.14	8.00 ^{aa} ±0.12	7.58 ^{ba} ±0.14
15	8.25 ^{aa} ±0.13	7.75 ^{ba} ±0.13	8.00 ^{aa} ±0.12	7.41 ^{ba} ±0.14	7.91 ^{aa} ±0.14	7.41 ^{ba} ±0.14	8.00 ^{aa} ±0.12	7.50 ^{ba} ±0.15

Means± SE with different small superscripts within a row and capital superscripts within column differ significantly (p<0.05).

C=Control, WGJMD=Wheat grass juice milk drink

Conclusion

Incorporation of wheat grass juice significantly (P<0.05) increased the chlorophyll content in flavoured milk drink. Storage period did not affect significantly (P<0.05) the quality characteristics and sensory scores till the end of storage. It is concluded that healthy flavored milk drink prepared with incorporation of wheat grass juice (milk: juice, 12: 1) in double toned milk can be stored up to 15 days with good quality characteristic and highly acceptable sensory scores.

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