

Original Research Article

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Development and Standardization of Fermented Health Drink from Mulberry Fruit (*Morus nigra*)

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ABSTRACT

Keywords

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Traditionally, mulberry fruit has been used as a medicinal agent to nourish the skin and blood, benefits kidneys treat weakness, fatigue, anaemia and premature graying of hair. An attempt has been made to develop fermented Health Drink and studied the physico-chemical characteristics of mulberry fruits. The *Morus nigra* fruits were collected and fermented health drink was developed with three variations such as with whole fruits, crushed fruits and crushed mulberry with Resins. The variation which was prepared by crushed mulberry fruits obtained highest score for all sensory attributes. Cent per cent incorporation was acceptable in fermented health drink. The physico-chemical characteristics of product were done. The cost of production fermented health drink was calculated. The shelf life study of developed fermented health drink was done and the score was high as the storage time increased, which may be due to aging. Thus fermented drink can be recommended as health drink as it is rich in nutrients and also for the anthocyanin content.

Introduction

Mulberry plant (*Morus sp.*) is cultivated in different parts of the world largely for its foliage, which is used for feeding silkworms (*Bombix mori* L.) in the production of silk. But depending on the location, it is also appreciated for its delicious fruits, medicinal properties, as animal feed, and for landscaping (Sinha, 2008). In recent years, mulberry fruit juice has been commercially produced as a health beverage and is quite popular in China, Japan and Korea.

The term 'Morus' comes from the Latin 'mora', meaning delay, probably because of the very slow development of its buds. In the development of the mulberry fruit, the calyx

adheres to the ovary and becomes an accessory part of the drupelet. The multiple fruit is composed of many small, closely appressed drupelets. The fruits are syncarps, ovoid with purple to black, juicy, edible pulp. The ripe fruits of different varieties differ in size and colour and vary in taste from insipid to sweet. These fruits are composed of balanced amount of sweetness and tartness with nutrient elements of vital importance (Reich, 1992). It contains a high quantity of carbohydrate and the dominant sweet taste of the ripe fruit, but usually somewhat bland, due to high water content and low level of other flavouring ingredients. However, a richer flavour develops, if the fruit is dried

Mulberry fruit is rich in anthocyanins, which have strong antioxidant property and can be considered as a potential source for production of a natural red colourant and for health benefits (Masilamani *et al.*, 2008).

Traditionally, mulberry fruit has been used as a medicinal agent to nourish the skin and blood, benefits kidneys treat weakness, fatigue, anaemia and premature graying of hair. It is also used to treat urinary incontinence, tinnitus, dizziness and constipation in the elderly and the anaemic, because the fruits are rich in vital nutrients and antioxidants especially anthocyanin (Sakagami *et al.*, 2007).

At present, cultivation of mulberry plants is for silkworm rearing only; the fruits are generally wasted and fruit production is not aimed in Karnataka. There is a great scope for the production of fruits and fruit based products.

The fruits usually wasted can be utilized for preparation of various value added products, which are of commercial importance from the industrial as well as health point of view. Considering the importance of value added products for nutritional security, an attempt has been made to develop fermented health drink, studied the physico-chemical characteristics of mulberry fruits and conducted sensory evaluation study for the developed products.

Materials and Methods

The *Morus nigra* fruits were collected from Department of Sericulture, GKVK, Bangalore and Shidlaghatta during August-September, 2011 and March-April, 2012. Three variations were tried out in fermented health drink. Different methods were used for the preparation of fermented health drink like, mulberry fruit in crushed form (MFD), whole mulberry fruit as such (AFD) and mulberry

fruit blended with resins at the ratio of 9:1 (BFD). In first two variations hundred per cent mulberry fruit is used as a fresh for the preparation of fermented health drink. They were inoculated with 3 to 4per cent of yeast starter culture (*Saccharomyces cerevesae*).

Developed products were evaluated using nine points hedonic scale by 10 to 15 semi trained panel of judges from the Department of Food Science and Nutrition, Post Harvest Technology and Department of Horticulture, UAS, GKVK, Bangalore.

The best accepted variation of the product was tested for the physico-chemical characteristics like total weight, pH, titrable acidity, TSS and per cent alcohol (Caputi *et al.*, 1968). Macro and micro-nutrients like Moisture, protein, fat, crude fibre, ash and energy (AOAC method), iron (Wong, 1928), vitamin C (Sadasivam and Manickam, 1997), calcium (Hawk *et al.*, 1957) and phosphorus, were analyzed using AOAC method.

Cost of the raw ingredients at the time of purchase, material cost and 20per cent as overhead charges were calculated to get the production cost.

The shelf life study of developed fermented health drink was done. The drink was stored in glass bottles of 100ml capacity at room temperature. The sensory evaluation for stored fermented health drink was done for two, four and six months.

Results and Discussion

Development value added product from mulberry fruit

From fresh mulberry fruits, the fermented health drink was developed with different treatment combination, which vary with preparation method.

Acceptability studies of fermented health drink from mulberry fruit

The developed products were evaluated for acceptance by semi-trained panel of judges and the results were statistically tested to see the significant difference between the levels. The score card on nine point hedonic scale, developed for organoleptic evaluation was based mainly on the appearance and colour, taste, texture, aroma and overall acceptability for different value added products. All the products were evaluated.

The final products were attractive and appetizing. This may be due to its balanced

amount of sweetness and tartness with nutrient elements of vital importance and its colour. In different treatment combination, the variation which was prepared by crushed mulberry fruits (MFD) was scored highest for all sensory attributes which are shown in table 1.

Physico-chemical characteristics of fermented health drink

The characteristics like pH, titrable acidity, TSS and per cent alcohol were tested for best accepted fermented health drink prepared by mulberry fruits, which are presented in table 2.

Table.1 Mean sensory scores of fermented health drink

| Treatment combination | Mean sensory scores | | | | | | | |
|-----------------------|---------------------|--------|-------------------|---------|-----------|-------|-------------|-----------------------|
| | Appearance | Colour | Aroma/ Bouquet | Acidity | Sweetness | Body | Astringency | Overall acceptability |
| MFD | 7.4 | 7.4 | 7.7 | 7.5 | 7.4 | 7.3 | 7.3 | 7.5 |
| AFD | 7.4 | 7.0 | 6.6 | 6.5 | 6.4 | 6.6 | 6.7 | 6.6 |
| BFD | 7.1 | 6.9 | 5.7 | 5.7 | 5.1 | 5.6 | 5.4 | 5.4 |
| F- value | NS | NS | * | * | * | * | * | * |
| SEm± | 0.060 | 0.080 | 0.056 | 0.056 | 0.079 | 0.078 | 0.082 | 0.058 |
| CD at 5% | - | - | 0.092 | 0.089 | 0.181 | 0.175 | 0.194 | 0.098 |

MFD – Mulberry (crushed)
 AFD – Whole mulberry
 BFD – Blended (Mulberry-90%; Resins-10%)
 *Significant at 5% level, NS: Non-significant
 No. of panel members: 10

Table.2 Physico-chemical properties of fermented health drink

| Characteristics | Fermented health drink (FHD) |
|----------------------------|------------------------------|
| Total weight | 150ml |
| Total soluble solids (TSS) | 6°BRIX |
| Titrable acidity | 0.58% |
| Per cent alcohol | 6.06% |
| pH | 3.59 |

Table.3 Nutrient composition (100g) of fermented health drink

| Parameters | Fermented health drink (FHD) |
|-------------------|------------------------------|
| Protein (g) | 1.6 |
| Fat (g) | 0.4 |
| Fiber (g) | 0.7 |
| Total ash (g) | 1.07 |
| Carbohydrates (g) | 125.4* |
| Energy (k.cal) | 529* |
| Iron (mg) | 2.97 |
| Vitamin C (mg) | 19.13 |
| Calcium (mg) | 77.39 |
| Phosphorus (mg) | 24.19 |
| Anthocyanin (mg) | 2.71 |

*Computed value

Table.4 Production cost of fermented health drink/100ml

| Ingredients | Amount (Rs./kg or litre) | Quantity (g/ml) | Price (Rs/-) |
|--|--------------------------|-----------------|--------------|
| Mulberry fruits | 200 | 100g | 20 |
| Sugar | 32 | 120g | 3.84 |
| Commercial Yeast (<i>Saccharomyces cerevisiae</i>) | 70 | 5ml | 0.21 |
| Total | - | 250ml | 24.05 |
| Overhead charges (20% of the cost) | - | - | 4.81 |
| Cost of the product | - | 250ml | 28.86 |
| | | 100ml | 11.54 |

(Round off to Rs. 12.00)

Table.5 Mean sensory scores during shelf life study of fermented health drink

| Treatment combination | Mean sensory scores | | | | | | | |
|-----------------------|---------------------|--------|---------------|---------|-----------|-------|-------------|-----------------------|
| | Appearance | Colour | Aroma/Bouquet | Acidity | Sweetness | Body | Astringency | Overall acceptability |
| Initial | 7.4 | 7.4 | 7.7 | 7.5 | 7.4 | 7.3 | 7.3 | 7.5 |
| 2 months | 7.6 | 7.5 | 7.6 | 7.6 | 7.5 | 7.5 | 7.3 | 7.5 |
| 4 months | 7.6 | 7.8 | 7.5 | 7.6 | 7.7 | 7.7 | 7.6 | 7.8 |
| 6 months | 7.8 | 8.0 | 7.7 | 7.8 | 8.4 | 7.8 | 7.9 | 8.4 |
| F- value | * | * | NS | NS | * | NS | * | * |
| SEm± | 0.051 | 0.062 | 0.049 | 0.048 | 0.083 | 0.050 | 0.053 | 0.044 |
| CD at 5% | 0.075 | 0.109 | - | - | 0.198 | - | 0.080 | 0.055 |

*Significant at 5% level, NS: Non-significant

No. of panel members: 10

It is evident from the results that the TSS recorded in fermented health drink was 6°BRIX, the titrable acidity was 0.58per cent, alcohol percentage was 6.06per cent and pH was 3.59. The increase in alcohol content was due to the complete conversion of sugars to alcohol. It was treated as fermented health drink with 6 per cent alcohol. Due to the low pH level, and level of alcohol percent did not rise up to the mark (7-14per cent) to convert it to wine with commercial *Saccharomyces cerevisiae*. Due to fermentation, micronutrients like B-complex vitamins increased, alcohol percent in lower amount helps in stimulating the nerves, and there was development of flavor and aroma. So, it was treated as fermented health drink with 6per cent alcohol.

It is evident from table 3 that, nutrient composition of fermented health drink was found to have high carbohydrates and energy because of addition of sugar to the product and was fair source of micro nutrients like, iron, calcium and phosphorus. In fermented health drink, protein was 1.6 per cent, fat 0.4per cent, crude fibre 0.7 per cent, carbohydrate 125.4 per cent, and total ash 1.07 per cent. The micronutrients like calcium 77.39mg per cent, phosphorus 24.19mg per cent, vitamin C 19.13mg per cent and iron 2.97mg per cent were present. It was found to have 2.71mg per cent of anthocyanin.

Estimation of cost for fermented health drink

Cost of production for fermented health drink was Rs. 12/- per 100ml (Table 4). It is not usual practice of selling of fruits in Karnataka. So the information about price of the mulberry fruit has been taken from North India *i.e.*, Himachal Pradesh. The *Morus Laevigata* and *Morus rubra* are sold in commercial markets in Himachal Pradesh.

Shelf life of developed food products

The product, fermented health drink was stored for six months and evaluated for sensory attributes. The results of the sensory attributes of stored products are presented in table 5. The sensory characteristics of fermented health drink were done for two, four and six months and the score was higher as the storage time increased (Table 5). It may be due to aging.

In conclusion, in Indian diets, anthocyanin component is generally low, and hence, such herbal supplements could be an important source. Mulberry fruit, rich in anthocyanins, could be considered as a potential source for production of a fermented health drink are is not available in the Indian market. Hence, there is a potential for commercialization. At present, cultivation of mulberry plants is meant for silkworm rearing only, and fruit production is not aimed in Karnataka. Cultivation of mulberry for silk worm rearing as well as for fruits could be an additional source of income of farmers.

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