



Formulation and evaluation of sapota flavoured cotton seed milk

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ABSTRACT

The research was undertaken with the object to develop the flavoured milk using cotton seed milk blended with sapota. Flavoured milk is a ready to drink food product which is made from unfermented milk. Cotton seed milk is an exclusive product that has not been dispirited widely as a food product. Cotton seed milk is an extract of cotton seeds which contains lipid and protein. As it is rich in protein it can be given to the protein energy malnourished population in the world. It also helps to flush out bad cholesterol, helps in maintaining blood pressure, helps in healing, prevents cancer and improves blood circulation and digestion. Sapota (Manilkaraachras mil) belong to the sapotaceae family, is one of the major food crops. It is also called as Sapodilla Plum, Chikoo, Naseberry and Mud-Apples. It is the major food crops widely grown in India, Mexico, Central America. The flavoured milk was done using cotton seed milk and sapota pulp in the concentration 90:10(T1), 80:20(T2) and 70:30(T3). The sensory evaluation was done using 9-point hedonic scale. The overall acceptability of the flavoured cotton seed milk of treatment T1, T2 and T3 was 7.30, 7.65 and 8.65 respectively. The most accepted was further taken for nutrient analysis, physico-chemical property and microbial analysis.

KEYWORDS: Cotton seed milk, protein energy malnutrition, sapota, flavoured milk, sensory analysis, nutrient analysis.

INTRODUCTION

Cotton seed (Gossypium) is from the malvaceae family (mallow family). Cotton seed is cultivated in many countries in both temperate and tropical climates. Cotton seed is rich in protein which has the capability in meeting the needs of the worlds rising population and improving its nutritional status. According to World Health Organization (WHO), Malnutrition refers to deficiencies, excesses or imbalances in person's intake of energy and or nutrients. As cotton seed is rich in protein it can save billions of populations from malnutrition. (Amudha. J, 2018)



Cotton seed milk is mostly used in India among south India where they are traditionally used in various household as welcome drink (k. jeshi, 2018). It is popularly known as Paruthi Paal (Paruthi means cotton seed and Paal means milk). Cotton seed milk is considered as “triple-nutrient” as it is a very rich source of protein, essential fatty acids and sugars. The milk is an extract of cotton seeds, which is rich in lipids and proteins. The gossypol a toxic terpenoid compound having non-nutritive value, present in the cotton seeds. This must be removed to make it fit for human utilization. The removal of this compound can be done by chemical, liquid treatment or air separation. The gossypol removed seeds can be used to prepare cotton seed milk. It is a very good alternative for cow’s milk. So, the people affected by lactose intolerance can consume cotton seed milk as an alternative to cow’s milk. It is helpful in flushing out bad cholesterol, in improving blood circulation and digestion, reduces body heat, good function of pancreas, bone marrow and nervous system (Amudha, J ,2018), (Manoj Kumar, 2019).

Flavoured milk is a ready to drink food product which is made from unfermented milk mixed with ingredients like sweeteners, fruit juice, coffee, aroma agents or other additives. The flavoured milk should be sterilized, pasteurized or boiled. The most accepted flavours used are chocolate, strawberry, vanilla, banana, and coffee. (Kamble. S, 2019).

Sapota (*Manilkara achras* mil) belong to the sapotaceae family, is one of the major food crops (Jadhav SS, 2018). It is the major food crops widely grown in India, Mexico, Guatemala, Venezuela, Central America. It is also grown in Thailand, Belize, Bangladesh, Vietnam, Pakistan, Indonesia, Maldives and Caribbean. (Dr. D Padmavathi, 2018), (Anand P. Kulkarni, et al, 2006). It is rich in fiber, Vitamin-C, vitamin-E, Vitamin- A. The different parts of the sapota tree have several medicinal properties, where the young fruits are used to stop diarrhea as it has tannins, the flowers are used to treat cold, cough and diarrhea, the bark can be used in preparing tea for treating fevers. The sapota can also be used in cosmetics as it is rich in Vitamin E, A and C. The fruits and crushed seeds can be used in preventing edema as it as diuretic property, and it also prevent from formation of kidney and bladder stones. The fruit reduces inflammation and pain in gastritis, reflux esophagitis and bowel disorders. The sapodilla boosts immunity, strengthens the intestine and prevents from many bacterial infections due to presence of vitamin-C. The fibre and vitamin-A content of sapodilla fruit helps in preventing lung cancer, colon cancer and oral cavity cancer. It is also useful in pregnancy due to its high nutritional content. It reduces weakness, nausea and dizziness and prevents from anemia. It also acts as a good anti-spasmodic agent. (Jadhav SS, 2018). When sapota pulp is added it improves the acceptability and sensory quality of the product.

An attempt was made to prepare flavoured milk from cotton seed milk where varying proportions of sapota pulp was added to it and jaggery syrup was added to the cotton seed milk and further studied for the sensory evaluation, nutrient analysis, Physico-chemical properties and microbial analysis.

MATERIALS AND METHODS

Cotton seed required for the study was obtained from the nearby market in Tambaram. The cotton seeds were soaked for 12 hours in water and it was drained. The moist cotton seeds were autoclaved using a pressure



cooker for 20 minutes. After the process it was grinded using the food processor and milk was removed using a stainless-steel strainer (1680 microns). Sapota required for the preparation of flavoured cotton seed milk was obtained from the nearby market in Chitlapakkam, Chennai. The following proportions of sapota pulp (puree) and cotton seed milk was used in the preparation of sapota flavoured cotton seed milk. (J. Amuda, 2018, K. Jeshi, 2018).

T1 10% sapota pulp + 90% cotton seed milk

T2 20% sapota pulp + 80% cotton seed milk

T3 30% sapota pulp + 70% cotton seed milk

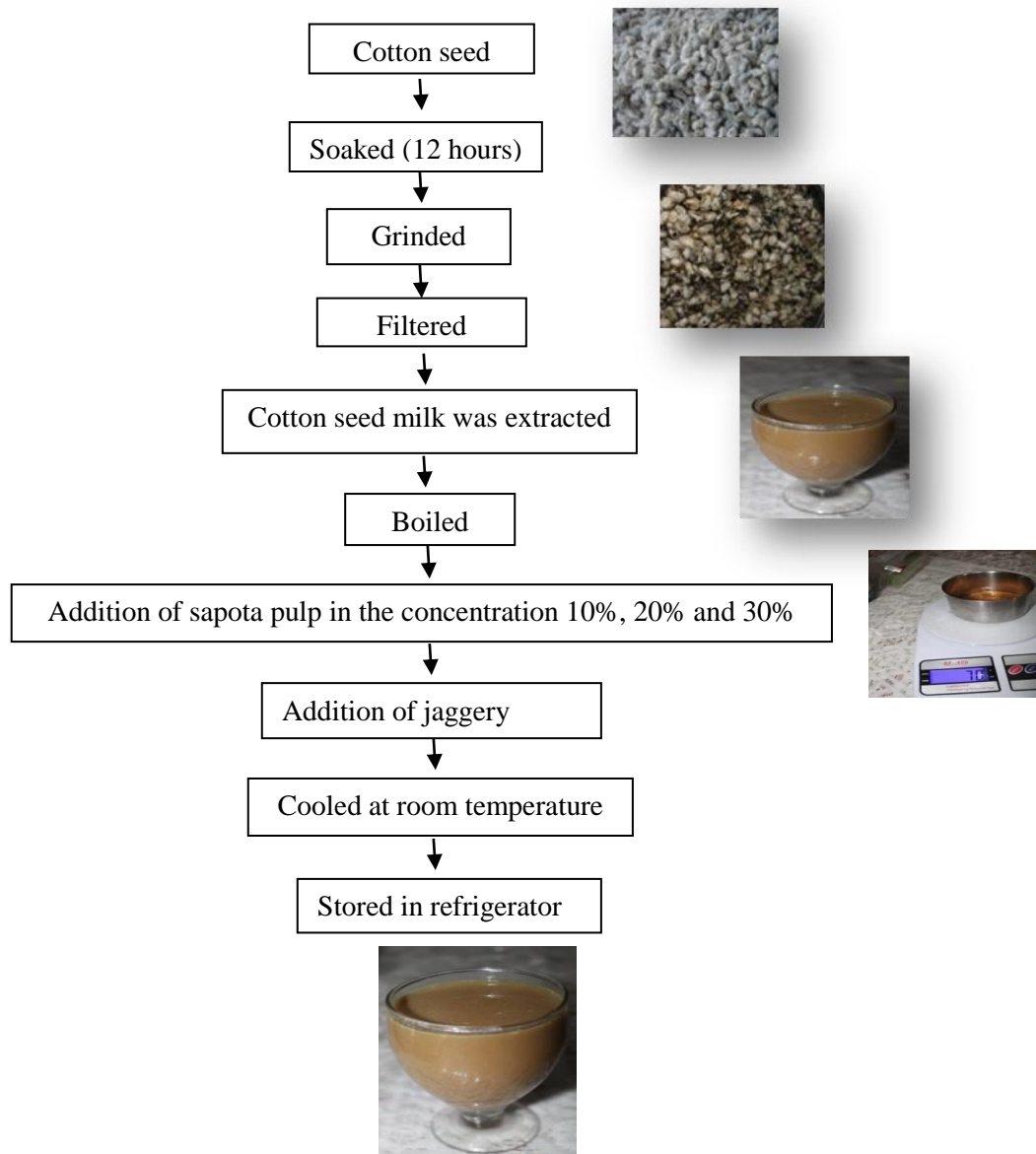
For the preparation of sapota pulp (puree), first sapota fruit was washed thoroughly with water. The sapota fruit was sliced using a knife. It was distorted into the food processor to make it into a pulp.

PREPARATION OF SAPOTA FLAVOURED COTTON SEED MILK

Sapota flavoured cotton seed milk was prepared by following the procedure as termed by S. T. Pakalwad (2010) with minor modification. The cotton seed milk was boiled at 70°C and it was rapidly cooled. The sapota pulp in different proportions was added and 6 gm of jaggery syrup was added for sweetness. The flowchart of preparation of sapota flavoured cotton seed milk is portrayed (figure-1).

The sapota flavoured cotton seed milk was subjected to sensory evaluation by 25 untrained panelists, using 9-point hedonic scale as described by S. T. Pakalwad. It was judged for colour, flavour, texture, appearance, taste and overall acceptability. The most accepted treatment was taken for further analysis.

Energy was determined using the method described by AOAC (2000), Protein was determined by using micro-kjeldhal method described by AOAC (1996), Fat was determined by using soxhlet method described by AOAC (2000), carbohydrate, dietary fibre, calcium and iron were determined using the method described by AOAC (2000). Physico-chemical property using AOAC (2000).



SAPOTA FLAVOURED COTTON SEED MILK

FIGURE 1-FLOWCHART FOR PREPARATION OF SAPOTA FLAVOURED COTTON SEED MILK

RESULTS AND DISCUSSION



SENSORY EVALUATION OF SAPOTA FLAVOURED COTTON SEED MILK

The Sapota flavoured cotton seed milk prepared from different proportions of sapota pulp and cotton seed milk were subjected to sensory evaluation and scores recorded for different parameter are presented in table 1.

It was absorbed that, the increase in sapota pulp increased the colour, flavour, texture, appearance, taste and overall acceptability of the flavoured cotton seed milk.

Table-I SENSORY EVALUATION OF SAPOTA FLAVOURED COTTON SEED MILK

TREATMENT	COLOUR	FLAVOUR	TEXTURE	APPEARANCE	TASTE	OVERALL ACCEPTABILITY
T1	7.34±0.71	7.26±0.75	7.21±0.90	7.17±0.77	7.21±0.90	7.30±0.82
T2	7.56±0.58	7.52±0.59	7.43±0.66	7.65±0.48	7.60±0.72	7.65±0.57
T3	8.39±0.65	8.47±0.66	8.60±0.49	8.56±0.50	8.56±0.72	8.65±0.48

Table-2 NUTRITIVE VALUE OF SAPOTA FLAVOURED COTTON SEED MILK

NUTRIENT	SAPOTA FLAVOURED COTTON SEED MILK
ENERGY (Kcals)	166.5
PROTEIN (gms)	27.80
FAT (gms)	0.843
CARBOHYDRATE (gms)	13.41
DIETARY FIBER (gms)	5.043
CALCIUM (mg/gm)	0.79
IRON (mg/gm)	3.85

NUTRIENT ANALYSIS

According to **Vandana Verma**, the nutrient content of strawberry milkshake using cow's milk were energy (67 Kcals), protein (3.2gm), carbohydrate (4.4gm), fat (4.1gm), calcium (120mg) and Iron (0.2mg)



respectively. In this study, the nutrient content obtained were energy (166.5 Kcals), protein (27.80gm), fat (0.843gm), carbohydrate (13.41gm), dietary fibre (5.043gm), calcium (0.79mg) and iron (7.85 mg) respectively. From the above result, it was concluded that the flavoured milk was rich in energy, protein, carbohydrate and iron.

PHYSICO-CHEMICAL PROPERTIES

TABLE 3 PHYSICO CHEMICAL PROPERTIES OF SAPOTA FLAVOURED COTTON SEED MILK

TREATMENT	VISCOSITY	ACIDITY	pH	TOTAL SOLUBLE SOLIDS	MOISTURE
T3	139.3 cps	1.5%	6.63	76.7% w/w	87.13%

From the above table it is observed that the viscosity, acidity, pH, total soluble solids and moisture was 139.3 cps, 1.5%, 6.63, 76.7% w/w and 87.13% respectively.

VISCOSITY

More kalpeshdilprao (2012) developed flavoured milk from blending buffalo milk and safflower milk. Safflower milk added in the proportion of 0, 10, 20 and 30 the average viscosity ranged from 6.18, 6.67, 6.80 and 8.80 percent, respectively. As the proportion of safflower milk in the blend increased there was increase in the viscosity of the flavoured milk.

Aher (2007) prepared papaya whey beverage and reported that as the proportion increased there was increase in viscosity content in papaya whey beverage. The viscosity of the papaya whey beverage increased from 7.91 to 8.51 cp.

According to Amudha J (2018) the viscosity of the cotton seed milk is ranged from 2.8 to 3.4 cP. Since the most accepted proportion was 30 percent, the increase in sapota pulp also increased the viscosity of the flavoured cotton seed milk.

ACIDITY

More kalpeshdilprao (2012) developed flavoured milk from blending buffalo milk and safflower milk. Safflower milk added in the proportion of 0, 10, 20 and 30 the average acidity ranged from 0.140, 0.152, 0.173 and 0.180 percent, respectively. They concluded that the proportion of safflower milk in the blend increased there was increase in the acidity of the flavoured milk.

Bala sahib son walker, et al (2017) developed flavoured milk by incorporating jackfruit pulp in the proportion 2.5, 5, 7.5 and 10. The acidity ranged from 0.153 to 0.163%. They concluded that the increase in acidity



may be 0 200 400 Viscosity Viscosity 81 due to high level of acidity in the original jackfruit pulp. They concluded that the increase in jackfruit pulp increased the acidity content. According to Amudha J (2018) the acidity content of cotton seed milk ranged from 0.17% to 0.19%. So, by adding the fruit pulp it increased the total acidity of the flavoured cotton seed milk. Since the most accepted proportion was 30%, the acidity content increased by the increase of sapota pulp.

pH

Upadhyay et al (2011) developed flavoured soy milk whey beverage. He concluded that when the proportion of soy milk increased there was decrease in pH of the flavoured whey soy milk beverage. More kalpesh dilprao (2012) developed flavoured milk from blending buffalo milk and safflower milk. Safflower milk added in the proportion of 0, 10, 20 and 30 the average pH ranged from 6.43, 6.19, 5.91 and 5.78 respectively. They concluded that the proportion of safflower milk in the blend increased there was decrease in the pH of the flavoured milk.

According to Amudha J (2018) the pH content of cotton seed milk ranged from 6.5 to 7.1. So, by increasing the addition of fruit pulp it decreased the pH of sapota flavoured cotton seed milk. Since the most accepted proportion was 30%, the increase in sapota pulp decreased the total pH value.

TOTAL SOLUBLE SOLIDS

Balasaheb sonwalker, et al (2017) developed flavoured milk by incorporating jackfruit pulp in the proportion 2.5, 5, 7.5 and 10. The total soluble solids ranged from 18.21 to 19.53. They concluded that the increase in jackfruit pulp increased the amount of total solids content. Since the jackfruit pulp as high amount of total soluble solids (23.57%) as compared to skim milk (9.53%). According to Amudha J (2018), the total soluble solid of cotton seed milk ranged from 11.8% to 13%. So, by adding the fruit pulp it increased the total soluble solids of the flavoured cotton seed milk. Since the most accepted proportion was 30%, the increase in sapota pulp, there was increase in total soluble content.

MOISTURE

More kalpeshdilprao (2012) developed flavoured milk from blending buffalo milk and safflower milk. The moisture content of the flavoured milk was 81.13 to 83.18 percent. As the proportion of safflower milk in the blend increased the moisture content of the flavoured milk increased, so the increase in proportion of sapota pulp increased the moisture content in the flavoured milk.

Kalchare (2002) prepared the sago lassi. He reported that the moisture content in the sago lassi was increased from 76.82 to 84.70 percent. As the proportion of safflower milk in the blend increases the moisture increased. So the increase in proportion of sapota pulp increased the moisture content in the flavoured milk.



TABLE 4 MICROBIAL ANALYSIS OF SAPOTA FLAVOURED COTTON SEED MILK

TREATMENT	YEAST COUNT	MOULD COUNT	TOTAL BACTERIAL COUNT
T3	1.5×10^2	2.0×10^2	0.66×10^2

The yeast, mould and total bacterial count of sapota flavoured cotton seed milk was 1.3×10^2 , 2.1×10^2 , 0.62×10^2 respectively. The standard total plate count for milk should not be more than 50×10^3 /ml. (Food Safety and Standards Authority of India, 2015). The product microbial content of the prepared product was within the permissible limit.

CONCLUSION

It is concluded that sapota flavoured cotton seed milk is rich in energy and protein and it can be given to the malnourished and lactose intolerant persons. Since the energy and protein is higher than the strawberry milkshake using cow's milk, cotton seed milk can be used as an alternative. Since the children's consumption of milk is reducing and lactose intolerance among people is increasing, flavoured milk was formulated to make them devour and the incorporation of fruit pulp was found to improve the quality of flavoured cotton seed milk. The study concluded that blending of sapota (30%) with cotton seed milk resulted in superior quality flavoured milk. So, future study can be done by using cotton seed milk in formulating different by products.

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