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Development of golden A2 milk blended with fresh turmeric rhizome juice and its nutritional evaluation

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Abstract
The aim of the study was to develop golden A2 milk blended with freshly harvested turmeric rhizome juice and soymilk. A2 milk, soymilk and turmeric rhizome juice with proportion as (70:20:10) were used. The prepared blend was analysed for its physical properties and chemical composition. The study revealed various physical properties as pH, acidity, specific gravity, TSS, density and viscosity. Chemical composition as moisture content 76.9%, protein 2.57%, fat 5.5 %, carbohydrate 9.57%, ash 0.74%, crude fiber 3.7% and curcumin 1.83 %. Golden A2 milk blended with turmeric rhizome juice and soymilk will be healthy option in range of various beverages.

Keywords: A2 milk, turmeric juice, FOS, soymilk, organoleptic evaluation, chemical composition

Introduction
Indian food processing trend is day by day moving towards the processing, preservation and value addition. The value addition involves the production of high-quality products and it is carried out with addition of functional ingredients by the method of fortification and enrichment. Beverage sector is one of the vastly growing sectors in food processing. Due to busy life schedule people wants healthy and nutritional drinks which will provide them health benefits and nutrition. Golden milk is a new term and it is also known as turmeric milk which is prepared from cow milk and plant-based milk.

Milk has long been one of the most popular foods chosen by humans due to its versatility in satisfying needs (Kundu *et al*., 2018) [6]. A2 milk comes from cows who have been bred not to generate the A1 beta-casein protein, which is a type of casein protein found in milk. This sort of cow's milk exists because A2 milk producers say that A1 protein causes gastrointestinal pain and bloating. According on the genetic background of the animals, the major forms of beta-casein are A1 and A2. Proline is found in A2 milk at the 67th position of the beta-casein amino acid chain (Behera *et al*., 2018) [2]. Milk with a high A2 beta-casein content is mostly seen in breeds from the Channel Islands and Southern France. Breeds such as Jersey, Charolais, and Limousin fall within this category. A1 and A2 beta-casein are both present in regular milk, whereas A2 milk solely includes A2 beta casein. Regular milk is thought to be less healthy than A2 milk because of beta caso morphin7 (BCM7). BCM 7 is an opioid peptide which is released during A1 beta-casein digestion (Sodhi *et al*., 2012) [10].

Turmeric (*Curcuma longa*) is derived from, a tropical South Asian rhizomatous herbaceous perennial plant in the ginger family Zingiberaceae. Turmeric is developed from a tuberous rhizome with a strong and segmented covering. Rhizomes are yellowish brown on the outside and dull orange on the inside (Ravindran, 2007) [8]. Indian turmeric is considered the best in the world because of its natural qualities and high concentration of the important bioactive component curcumin. Curcumin provides anti-inflammatory, anti-oxidant, antiviral, and antifungal properties. Turmeric can aid in the reduction of post-surgical inflammation. Turmeric inhibits the formation of blood clots, which aids in the prevention of atherosclerosis (Akram *et al*., 2010) [1].

Soyabean contains unsaturated fatty acids, high-quality proteins, and fiber. It includes both omega-6 and omega-3 fatty acids, with linoleic acid accounting for 56% of total fat and alpha-lenolenic acid accounting for 7-8% of total fat. When cooked, soybeans are abundant in iron, phosphorus, magnesium, vitamin B2 (riboflavin), and folate (Kadam *et al*., 2012) [3]

Soy milk, often known as soy drink or soy beverage, is a soybean-based beverage. It is a stable oil-protein-water emulsion that is created by soaking and crushing soybeans in water. Soy milk has about the same protein content as cow's milk. (Pereira *et al*., 2002) [7].

Soymilk's growing popularity as a beverage is due to its health benefits. This drink is cholesterol-free and low in calories, it may provide health advantages by lowering body weight and blood lipids. Soymilk, with its distinct nutty flavor and high nutritional value, can be used as a substitute for dairy milk (Kohli *et al*., 2017) [5].

Fructo-oligosaccharides are nondigestible carbohydrates that represent one of the main bifidogenic oligosaccharide classes. FOS is an essential ingredient of functional food because of its improved nutritional, organoleptic, and functional properties. In place of sugar or fat, fructo-oligosaccharides are commonly used. (Kherade *et al*., 2021) [4].

The present study was carried out for development and quality evaluation of golden A2 milk with freshly harvested turmeric rhizome juice, blending with soymilk.

Materials and Methods

Materials

A2 cow milk was procured from dairy farm, VNMKV Parbhani. Soyabean and turmeric rhizomes were obtained from local market. Present research work was carried out in Department of Food Engineering, College of Food Technology, Parbhani.

Methods

Preparation of turmeric juice from freshly harvested rhizome

Fresh turmeric rhizomes were washed and cleaned to remove all impurities. Peeling was done to produce clear turmeric juice then the rhizomes were sliced into small pieces in order to extract juice using a juice extractor. The resulting juice was filtered using muslin cloth to get clear juice.

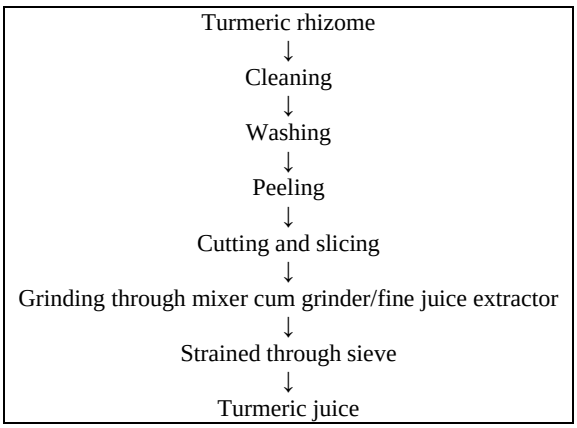

Fig 1: Preparation of turmeric rhizome juice

Preparation of soymilk

Soyabean was sorted to remove stones, broken and deformed seeds. Then beans were cleaned and steeped in water with 0.5% NaHCO3 overnight. After that, it was rinsed and blanched for 10-15 minutes. The rehydrated soybean was cleaned, dehulled manually by hand rubbing, and rinsed and remove the okra. The soybean seeds were mashed in grinder and expressed in a 6:1 (water to beans on a weight basis) ratio. The extracted milk was then heated and homogenized to enhance flavour and destroy trypsin inhibitor. (Kohli *et al*., 2017) [5].

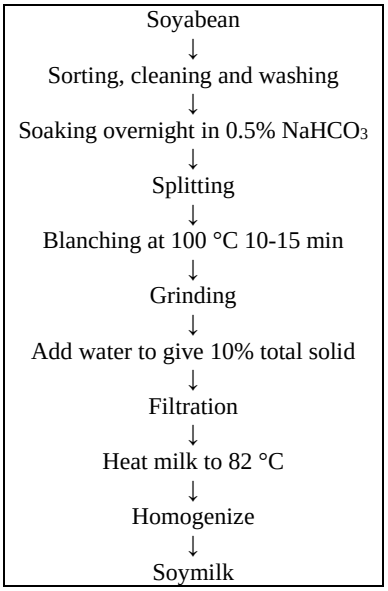

Fig 2: Preparation of soymilk

Formulation for preparation of golden A2 milk

Table 1: Formulation for preparation of golden A2 milk

Ingredients	Quantity
Cow milk	70 ml
Soymilk	20 ml
Turmeric rhizome juice	10ml
Fructo-oligosaccharide	12 gm

The blend was prepared with using cow milk, soymilk, turmeric rhizome juice and fructo-oligosaccharide as 70ml, 20ml, 10 ml and 12 gm respectively.

Preparation of golden A2 milk blended with turmeric rhizome juice and soymilk

After preparation of turmeric rhizome juice and soymilk, cow milk (A2 milk) was added in different proportion. According to different recipe formulations golden A2 milk with turmeric rhizome juice and soymilk was prepared. Fructo-oligosaccharide used as sweetener (12 gm /100ml) of golden milk. The prepared blended milk heated at 80 ^{0}C for 10 minutes and cooled at room temperature and then filled in sterilized glass bottles of capacity 200 ml. Filled bottles were stored at refrigeration temperature (4±1 °C).

Preparation of golden A2 milk blended with turmeric rhizome juice and soyamilk

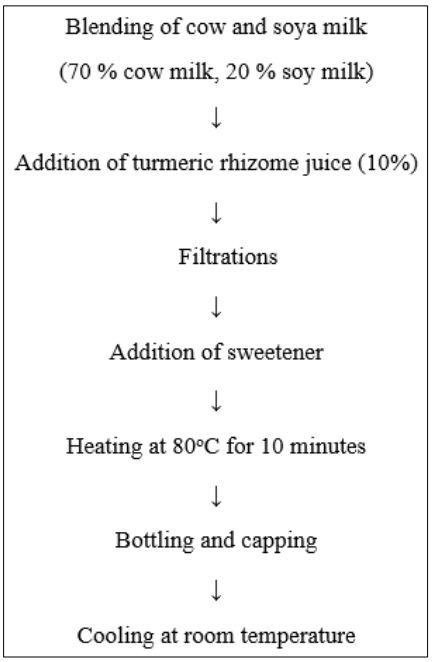

Fig 3: Process flow chart for preparation of golden A2 milk blended with turmeric rhizome juice and soymilk

Results and Discussion

Physical properties of golden A2 milk with turmeric rhizome juice and soymilk

Data pertaining to physical properties such as pH, acidity, specific gravity, TSS, density and viscosity were analysed and depicted in table 1.

Table 2: Physical properties of golden A2 milk with turmeric rhizome juice and soymilk

Parameter	Value*
pH	6.3
Acidity (%)	0.62
Specific gravity	1.081
TSS (°Bx)	19
Density	1.077
Viscosity (CP)	7.62

Data from table 2 reveal that the pH of golden A2 milk was 6.3, acidity 0.62, specific gravity 1.081, TSS 19, density 1.077 and viscosity 7.62. The similar findings were observed by Rehman *et al.*, (2007) [9].

Chemical composition of golden A2 milk with turmeric rhizome juice and soymilk

Data pertaining chemical composition of prepared golden A2 milk with turmeric rhizome juice and soymilk such as moisture, protein, fat, carbohydrate, ash and crude fiber given below.

Table 3: Chemical composition of golden A2 milk with turmeric rhizome juice

Parameter	Value*
Moisture (%)	76.9±0.3
Protein (%)	2.57 ± 0.1
Fat (%)	5.5 ± 0.2
Carbohydrate (%)	9.57 ±0.3
Ash (%)	0.74 ± 0.05
Crude fiber (%)	3.7 ± 0.14
Curcumin	1.83 ± 0.1

*Each value represents the average of three determinations

The data from table 3 represents that moisture content found to be 76.9±0.3 per cent while protein, fat, carbohydrate, ash, crude fiber, curcumin was 2.57 ± 0.1, 5.5 ± 0.2, 9.57 ±0.3, 0.74 ± 0.05, 3.7 ± 0.14 and 1.83± 0.1 per cent respectively.

Conclusion

A2 milk represents good digestibility qualities, soymilk have high quality protein with a low amount of saturated and trans fatty acids and all are familiar with goodness of turmeric. Turmeric is rich source of antioxidant as it is filled with curcumin. Considering nutritional profile of ingredients, the golden A2 milk with freshly harvested turmeric rhizome juice was prepared. It is observed that the prepared drink is good source of protein and crude fiber. Crude fiber found to be 3.7%. Curcumin content found to be 1.83 %.

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