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# Preparation and Physicochemical Evaluation of Dairy Free Alternative Based on Coconut and Millet Milk

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## Abstract
Dairy free alternative based on plant milk offers potential alternative for substitution of mammalian milk in diet of people suffering from milk allergy and lactose intolerance. The present study was thus aimed to evaluate the effects of different combinations (40-60%) of millet milk and coconut milk for developing a plant-based milk alternative. The formulation for development of coconut and millet milk on the basis of sensory evaluation, the milks were blended in different concentrations. The treatments were $T_{01}$ (millet milk), $T_{02}$ (coconut milk), $T_1$ (60% millet milk + 40% coconut milk), $T_2$ (50% millet milk + 50% coconut milk), $T_3$ (40% millet milk + 60% coconut milk) and cow milk ($T_0$) was taken as control. All the treatments were examined for proximate as well as sensory properties. Significant differences of ($p<0.05$) were examined in moisture from (75.12 to 90.96%), ash (0.51 to 1.68%), protein (0.55 to 3.29%), fat (0.51 to 19.96%), pH (6.086 to 6.76), total solids (9.16 to 24.90%), titratable acidity (0.18 to 0.38%), Calcium (0.11 to 16.88 mg/100g) and iron content (0.07 to 0.59 mg/100g). The nutrient profile of millet-coconut milk blend prepared with 50% millet milk and 50% coconut milk was better among all the milks analyzed. The selected milk blend ($T_2$) was also rated quite good in terms of acceptability on sensory evaluation. The nutritional and sensory attributes indicated that millet-coconut may serve as good replacer of Mammalian milk and can be used as non dairy milk alternative.

**Keywords**
Dairy free alternative, coconut milk, millet milk, nutrient profile, blends.

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## INTRODUCTION
Global demand has been increasing recently for the products that contain dairy free alternatives because serious health problems are related to some of the nutrients present in the milk [1]. Clinical studies have shown that some components of milk are associated with deleterious health effects such as lactose

intolerance (LI), cow milk allergy (CMA), anaemia and coronary heart diseases [2, 3, 4]. The risk of these diseases can only be reduced when such milk products are avoided. Due to these problems associated with bovine milk, as well as more preference to vegan diets, health conscious consumers are preferring dairy free alternatives. Plant sources contain health promoting components such as antioxidants, minerals, vitamins and dietary fibres that constitutes functional foods and nutraceutical components [5]. Functional foods are those whole, fortified, enriched or enhanced foods which promote health beyond providing basic nutrition when consumed at optimum levels on a regular basis [6].

Plant based milk offers potential alternative for substituting milk in diet minerals, unsaturated fats, protein and being devoid of allergens and other risk associated components. Absence of lactose and cholesterol in plant-based milk makes it convenient for use by population suffering from lactose intolerance and heart diseases. Plant-based milk alternatives are liquids derived from dissolution and disintegration of plant material in water and further homogenization for reduction in particle size within range of 5-20 µm, such that it resembles bovine milk in appearance and consistency to a great extent [7]. Generally, plant-based milks are prepared from cereals, seeds, legumes and nuts because they have favorable attributes that make them convenient to combine for obtaining dairy-free nutritious, health promoting, economical and palatable plant-based milk alternative [8].

Coconut belongs to the family *Arecaceae* and is botanically known as *Cocosnucifera.* Coconut milk is a sweet, milky-white, oil-in-water emulsion extracted from fresh coconut flesh using mechanical force, with or without addition of water [9, 10]. The major constituents of coconut milk are water and fat in addition to carbohydrate, protein, and ash [11]. Coconut milk also contains vitamin (vitamin C & E) and minerals such as iron, calcium, potassium, magnesium and zinc [12]. Studies have demonstrated that coconut milk contains higher amount of fat and calories than cow milk [13]. Coconut milk is a rich source of proteins such asprolamin, albumin, globulin, and glutein in addition to emulsifying agents such as lecithin and cephalin which are present in substantial amounts in coconut milk [14]. Unlike other types of milks, coconut milk has a characteristic abundance of medium chain saturated fatty acids (MCFA) which are associated with lowering heart diseases and risk of stroke by reducing cholesterol and triglyceride levels. Furthermore, the body does not store the fats present in coconut thus coconut fats are less likely to clog arteries. This characteristic makes coconut milk a healthy alternative to cow milk when it comes to ameliorating the heart health [15].

Millet is the fifth most important cereals in the world and considered as a highly palatable and good source of energy, protein and minerals [16]. Millets are excellent source of several health promoting components as compared to conventional staple foods [17]. Millets are the good source of micronutrients, antioxidants, phytochemicals and some essential amino acids [18, 19]. Some components of millet such as phytates, phenol and tannins provide anti-ageing benefits [20]. Dietary fiber and micronutrients present in millet are useful in maintenance of health and prevention of several diseases such as type-2 diabetes [21], breast cancer and heart diseases. The also facilitate the metabolism of fat and tissue repair and combat issues correlated with blood cholesterol [22].

Millet milk is a good source of minerals like calcium, iron, phosphorus etc. However due to low sensorial attributes of millet milk; blending with coconut milk could be a good option to improve the palatability of millet milk. Thus, the addition of the coconut milk into the millet milk could increase the nutritional as well as sensory profile by masking the off flavour of dairy free alternative. Very less work has been done on such type of milk blend preparation from millet. It is also beneficial from market point of view due to its low cost and high nutritive value. So, the present study was undertaken to prepare the low cost value-added low-cost value-added milk alternative from underutilized millet crop by blending coconut milk into it.

## MATERIALS AND METHODS

### Raw Material

Millet grains were procured from a local market in Rohtak (Haryana). Fresh and good quality coconuts were procured from Reliance fresh, Rohtak (Haryana).

### Preparation of Millet milk

### Millet milk making protocol

For preparation of millet milk, dry millet grains were boiled in water. Once the water started boiling, the temperature was reduced just to heat the mixture for 30 minutes to obtain a water-logged porridge. Then the porridge was mixed with cold water and blended until pulverized completely with a regular speed blender. Then the mixture thus obtained was strained.

**Optimization of level of grain: water in millet milk**

The optimization of level of grain and water to be used in preparation of millet milk was done on the basis of preliminary trials using millet grains and water in different ratios (1:4; 1:6 and 1:8). The basis for selection of the most suitable ratio was sensory profile of the millet milk. The most acceptable ratio was 1:6 as it revealed less pronounced astringent flavor and was not too diluted. The astringent flavor was acceptable with the assumption that it would be later reduced by mixing with coconut milk during optimization trials.

**Preparation of Coconut milk**

**Coconut milk making protocol**

For preparation of coconut milk, freshly de-husked coconut was grated finely. The grated coconut was ground with water in a high speed blender for 5 minutes to completely pulverize the coconut meat. The comminuted meat was squeezed through a two layer muslin cloth and the extracted coconut milk was filtered through a sieve of 100 mesh size.

**Optimization of ratio of coconut: water in coconut milk**

Preliminary trials using different ratios of coconut and water (1:1; 1:2 and 1:3) were carried out to optimize the level of coconut and water for the preparation of coconut milk. The evaluation of the most suitable ratio was done on the basis of sensory attributes. The ratio 1:1 was found most suitable as it displayed good consistency and imparted better mouth feels than other two ratios.

**Preparation of millet-coconut milk blends**

Different blends were prepared by mixing millet milk and coconut milk in different proportions as given in Table 1.

**Chemical Analysis**

The samples were analyzed for ash content, titratable acidity, moisture content and total solids content as per standard AOAC methods [23]. pH was determined by method given by Ranganna [24]. Protein content was estimated by standard Kjeldahl method given in AOAC [25]. Calcium & iron content was determined by AAS method described in AOAC [26]. Fat content was determined by Gerber Method described in IS [27].

**Sensory evaluation**

Fresh milk samples were analyzed for sensory characteristics evaluated by a panel of 10 semi-trained members using a 9-point hedonic scale [24]. The panelists were asked to rinse their mouth before they evaluated sample for sensory analysis. The assessment involves the consideration of color, flavor, taste, aroma and overall acceptability.

**Statistical analysis**

Data were analyzed using one-way analysis of variance (ANOVA) procedures in a randomized complete block design with three replications. Statistical analysis was performed using the OPSTAT software version opstat1exe (Hisar, India)

## RESULTS AND DISCUSSION

**Optimization of millet milk formulation**

Millet milk was prepared by boiling millet grains in water in different millet and water ratios (1:4, 1:6, and 1:8). On subjecting the samples to sensory analysis, a very astringent taste was observed for millet milk (1:4) whereas (millet milk) 1:6 revealed rather less pronounced astringent flavour. In contrast, the off flavor was completely absent for millet milk (1:8). However, it was too diluted to be regarded appropriate for selection as milk alternative. It also displayed lower nutritional profile owing to high level of dilution used. On the basis of these aspects, millet milk (1:6) was considered most suitable for preparation of milk for further treatments considering the fact that slight astringent flavor of millet milk would be later overcome in further optimization on blending it with coconut milk.

**Optimization of coconut milk formulation**

Coconut milk was prepared by using different coconut to water ratio (1:1, 1:2, and 1:3). Coconut milk (1:1) prepared with equal proportion of coconut and water displayed good consistency as well as better mouth feel which might be due to its high total solids content. On the other hand, coconut milk (1:2) and (1:3) were comparatively more diluted and displayed lower total solids content which imparted its poor sensory properties. Due to healthier attributes and better sensory profile coconut milk (1:1) was adjudged most suitable for the preparation of coconut milk for further optimization of milk blends.

**Physicochemical characteristics of millet and coconut milk**

The results evaluated for physicochemical characteristics of millet milk and coconut milk are presented in Table 2. The tabulated data show the values of moisture, titratable acidity, pH, fat, protein, calcium, iron, total solids and ash in both millet and coconut milk.

The millet and coconut milk showed significantly different ($p<0.05$) values for all the parameters. Millet milk had the highest moisture content (90.96%) whereas coconut milk displayed the lowest value for the moisture content (75.10%). The high moisture content of millet milk might be due to

higher dilution level used in millet milk preparation. Moisture content in coconut milk in present study agrees well with several earlier reports [11, 14]. While coconut milk had comparatively higher values for titratable acidity (0.35%) and total solids content (25.16%), values for pH (6.47) and ash content (1.686%) were observed higher for millet milk. It is evident from the table that coconut milk displayed considerably higher values of almost all of the nutritional attributes i.e. fat (19.96%), protein (1.97%), iron (0.59 mg/100g) and calcium (16.88 mg/100g), fat being about 20 times higher and protein being fourfold higher in comparison of millet milk.

**Physicochemical properties of different milks and milk blends**

Moisture is an important factor which affects the quality and shelf life of the food product. Determination of moisture content is also necessary to calculate the content of other food constituents on a uniform basis (i.e., dry weight basis). The results obtained regarding moisture content of control and different combinations of milk blend samples are presented in Table 3. The results demonstrated that moisture content of all different milk samples ranged from 75.12% to 90.96%. Moisture content for cow milk was recorded as 85.98% and similar value was also reported by De [28]. Among all the milk blends, Treatment $T_1$ having highest proportion of millet milk showed highest moisture content (84.24%) whereas the lowest value of all was recorded for Treatment $T_3$(80.13%) which was having highest proportion of coconut milk. The higher value of moisture content for $T_1$ could be due to higher level of water used for the formulation which contributes towards lower total solids content and hence higher moisture. Moisture content varied in all other milk blends and showed significant differences ($p<0.05$) due to the different compositional ratio of millet milk to coconut milk used in preparation of milk blends. Tansakulet al. [11] and Alyaqoubiet al [14] reported similar results for coconut milk in their studies.

The data obtained regarding ash content of control and different combinations of milk samples are presented in table 3. The ash content is a measure of the total amount of minerals present within a food and refers to the inorganic residue left after complete oxidation of the organic matter of the food product. Statistical analysis of data revealed that values for ash content of all milk samples were significantly different ($p<0.05$). The ash content of the milk blends was increased remarkably from 0.86% to 1.10% as the millet milk concentration increased from 40-60 ml per 100 ml of milk. Milk blends showed different values for ash content due to the variations in ratios of millet and coconut milk used in preparation of milk blends. Millet milk expressed high ash content due to presence of large amount of minerals in millet [29]. It contains about 92.5% dry matter, 2.1% ash [30]. During the manufacture of millet milk, when porridge has been separated from milk, very less amount of the minerals is left thereafter in the milk. This accounts for lower ash content in millet milk as compared to millet flour. Rathoreet al. [31] also observed reduction in mineral content after dehulling of millet grains which resulted in reduction of ash content. Value for ash content of coconut milk was observed about 0.516%. The value for ash content of coconut milk observed in the study is close to those reported by Tansakulet al. [11] and Alyaqoubiet al. [14].

The protein content varied significantly ($p<0.05$) among all the milk blends and differed from 1.06% to 1.43%. Maximum protein content was observed for cow milk (3.29%) while coconut milk contained the next highest level of protein (1.97%). The results clearly indicated that the protein content of blends increased with increase in the proportion of coconut milk in the milk blends. Results observed in present study were in alignment with those observed by Tansakulet al. [11]. Blends prepared with higher amount of millet milk showed lower amount of protein content which could be due to the fact that most of the protein content in millet grain is found in its outer layer [32,18,33], which was separated during milk processing and thereby lowering the protein content. The process of milk manufacture removes the outer pericarp where protein is concentrated and a decrease in extractable protein was thus analyzed in millet milk as compared to 13.6% protein content normally found in millet flour [30]. All milk samples were observed with lower protein content than cow milk however absence of proteins like casein associated with allergic reaction [34] makes them a suitable choice for non-dairy milk alternative.

Fat content is an important parameter when evaluating the nutritional composition of the food products. The results demonstrated that coconut milk had the highest (19.96%) amount of fat compared to all the milk samples whereas millet milk had the lowest (0.51%) amount of the same. Different milk samples had intermediate values of fat content depending upon the ratio of coconut and millet milk used in blend. Treatments $T_1$, $T_2$ and $T_3$ displayed 7.73%, 9.833% and 11.466% fat content respectively. It is evident from the table that blends having higher level of coconut milk displayed higher

fat content. Coconut milk contains fat in the form of medium chain saturated fatty acid (MCFAs) and contains particularly, lauric acid [35]. Millet normally contains 7.8% fat in raw grain [30], however millet milk prepared from it showed lower amount of fat content. This could be due to the fact that appropriate amount of water was used in manufacture of millet milk and fat being immiscible in water was extracted to very less extent in millet milk which is supported by the findings of Wadieet al. (2014).The results reported in the present study are in conformation with Alyaqoubiet al. [14].

The statistical analysis of pH values for control sample and different combinations of milk blends revealed a significant difference ($p>0.05$) in the milk samples. It is an important parameter as pH measures the degree of acidity or alkalinity of a product As compared to all milk samples, cow milk had the highest pH value (6.76) followed by millet milk (6.47)whereas $T_{02}$ (coconut milk) showed the lowest value (6.08). Other milk samples also demonstrated with significant differences in their pH values based upon different proportions of millet and coconut milk used in the blends. Tansakul [11] reported comparatively lesser pH value (5.8) as compared to the present study whereas similar result of pH (6.0) was reported by Alyaqoubiet al. [14] for coconut milk.

The mineral content varied significantly ($p<0.05$) among all the milk samples. The results obtained regarding mineral content of control and different combinations of milk samples are presented in Table 3. The results demonstrated that coconut milk displayed highest values (16.88 mg/100 ml for Ca and 0.59 mg/100ml for iron) of mineral contents as compared to all the milk samples analyzed. Millet milk showed lowest values (8.20 mg/100ml and 0.16 mg/100ml) for the same. The value for mineral content increased in blends as increased the proportion of coconut milk in their formulation. The mineral content of millet and coconut milk was recorded higher than cow milk, which is an interesting finding from nutritional point of view. Millet grains are also rich in minerals but very less amount of these are extracted in milk during processing. Rathoreet al. [31] also observed reduction in mineral content in millet flour after dehulling of millet grains. Hulseet al. [36] reported higher amount of calcium and iron content 42 mg/100 g and 11 mg/100 g respectively in millet.

The results analyzed for total solids content of control and different combinations of milk samples are presented in Table 3. All milk samples showed significantly different ($p<0.05$) values for total solid content. Coconut milk ($T_{02}$) was observed with highest total solids content (24.90%) whereas millet milk ($T_{01}$) had the lowest value of total solid content (9.167%). Among the milk blends, Treatment $T_3$ displayed highest total solid content (20.13%) followed by Treatments $T_2$ (17.83%) and $T_1$ (15.76%). The high proportion of fat content might have contributed to the high total solids content in coconut milk. The value of total solids for cow milk was recorded as 12% and similar result was reported by De [28]. The total solids content of coconut milk is in agreement with the findings of Tansakulet al. [11]. Generally the acidity of milk means the total acidity (Natural + developed) or titratable acidity. Significant differences ($p<0.05$) were observed among all the milk samples for titratable acidity. Cow milk showed lowest value of titratable acidity (0.18%). Among the other milk samples, millet milk was observed with lowest value for titratable acidity (0.24%) while coconut milk had the highest (0.35%) value of acidity. The values observed for treatments $T_1$, $T_2$ and $T_3$ were 0.31%, 0.34% and 0.36% respectively. Values obtained in this study are fairly within the range. Abdullah et al. [14] also reported similar results for titratable acidity as observed in the present study.

**Sensory evaluation**

Sensory profile is the most important parameter that contributes to overall quality of the product. The sensory evaluation of freshly prepared milk blends was done by using a nine point hedonic scale. Out of the different blends of millet-coconut milk analyzed, acceptability of $T_2$ was found to be higher as compared to other blends. Coconut milk gives good mouth feel which masked the astringent flavour of millet milk in blend. High fat content of coconut improves the mouth feel and sensory properties of the mixture. Emulsifying agent present in coconut milk gives stability to the mixture. Sample $T_1$ showed least sensory properties among all blends, due to higher proportion of (60%) millet milk that rendered astringent flavour which remain pronounced in the blend. Treatment $T_3$ (40% millet milk + 60% coconut milk) showed average acceptability due to its moderate sensory characteristics as a blend of millet and coconut milk. Due to presence of high concentration of coconut milk it displayed a more pronounced coconut flavor. Blend $T_2$ (50% millet milk + 50% coconut milk) was observed with highest acceptability in all comparative milk blends in all parameters, from which they were passed through. Rather cow milk was highly acceptable in comparison of all these plant based milk samples but millet-coconut milk contained good amount of minerals

which makes these plant based milk blends more nutritional than cow milk.

**Table 1 Combination of Millet milk and Coconut milk in different proportions**

| Treatments | Millet milk | Coconut milk |
|---|---|---|
| $T_0$ | - | - |
| $T_{01}$ | 100% | - |
| $T_{02}$ | - | 100% |
| $T_1$ | 60% | 40% |
| $T_2$ | 50% | 50% |

**$T_0$ (cow milk) was taken as control.**

**Table 2 Physico-chemical characteristics of millet milk and coconut milk**

| Parameter | Millet milk | Coconut milk |
|---|---|---|
| Moisture (%) | $90.960 \pm 0.636^b$ | $75.100 \pm 0.719^a$ |
| Titratable Acidity (%) | $0.24 \pm 0.000^a$ | $0.35 \pm 0.000^b$ |
| pH | $6.470 \pm 0.070^b$ | $6.086 \pm 0.086^a$ |
| Total solids (%) | $9.167 \pm 0.577^a$ | $25.167 \pm 0.288^b$ |
| Ash (%) | $1.686 \pm 0.083^b$ | $0.516 \pm 0.040^a$ |
| Iron (mg/100g) | $0.167 \pm 0.012^a$ | $0.590 \pm 0.010^b$ |
| Calcium (mg/100g) | $8.206 \pm 0.070^a$ | $16.887 \pm 0.062^b$ |
| Fat (%) | $0.500 \pm 0.346^a$ | $19.966 \pm 0.305^b$ |
| Protein (%) | $0.550 \pm 0.522^a$ | $1.974 \pm 0.035^b$ |

**The values are mean ± S.D. of three independent determinations ($p<0.05$). The mean values were compared at 5% level of significance. Mean values having different superscript letters are significantly different.**

**Table 3 Physicochemical properties of different milks and milk blends**

| Parameter | $T_0$ | $T_{01}$ | $T_{02}$ | $T_1$ | $T_2$ | $T_3$ |
|---|---|---|---|---|---|---|
| Moisture (%) | $85.984 \pm 0.023^e$ | $90.960 \pm 0.636^f$ | $75.123 \pm 0.619^a$ | $84.240 \pm 0.240^d$ | $82.167 \pm 0.814^c$ | $80.132 \pm 0.516^b$ |
| Ash (%) | $0.715 \pm 0.009^b$ | $1.686 \pm 0.083^f$ | $0.516 \pm 0.040^a$ | $1.106 \pm 0.073^e$ | $0.919 \pm 0.015^d$ | $0.865 \pm 0.033^c$ |
| Fat (%) | $4.382 \pm 0.006^b$ | $0.513 \pm 0.016^a$ | $19.966 \pm 0.305^f$ | $7.733 \pm 0.010^c$ | $9.833 \pm 0.016^d$ | $11.466 \pm 0.152^e$ |
| Protein (%) | $3.296 \pm 0.006^f$ | $0.550 \pm 0.043^a$ | $1.974 \pm 0.025^e$ | $1.068 \pm 0.019^b$ | $1.274 \pm 0.023^c$ | $1.432 \pm 0.021^d$ |
| Total Solids (%) | $12.013 \pm 0.003^a$ | $9.167 \pm 0.033^b$ | $24.900 \pm 0.047^f$ | $15.760 \pm 0.032^c$ | $17.833 \pm 0.024^d$ | $20.132 \pm 0.050^e$ |
| pH | $6.762 \pm 0.008^f$ | $6.470 \pm 0.020^e$ | $6.086 \pm 0.004^a$ | $6.167 \pm 0.010^d$ | $6.107 \pm 0.011^c$ | $6.094 \pm 0.002^b$ |
| Titratable acidity (%) | $0.181 \pm 0.002^a$ | $0.242 \pm 0.004^b$ | $0.380 \pm 0.002^f$ | $0.310 \pm 0.001^c$ | $0.342 \pm 0.003^d$ | $0.363 \pm 0.002^e$ |
| Calcium (mg/100g) | $0.117 \pm 0.016^a$ | $8.206 \pm 0.070^b$ | $16.887 \pm 0.062^f$ | $13.200 \pm 0.035^c$ | $16.012 \pm 0.054^d$ | $16.427 \pm 0.107^e$ |
| Iron (mg/100g) | $0.072 \pm 0.007^a$ | $0.167 \pm 0.012^b$ | $0.590 \pm 0.010^f$ | $0.273 \pm 0.005^c$ | $0.303 \pm 0.004^d$ | $0.392 \pm 0.003^e$ |

**The values are mean ± S.D. of three independent determinations ($p<0.05$). The mean values were compared at 5% level of significance. Mean values having different superscript letters are significantly different.**

**Table 4 Sensory evaluation of different milks and milk blends**

| | Colour | Flavour | Mouthfeel | Overall acceptability |
|---|---|---|---|---|
| $T_0$ | $8.210 \pm 0.073^d$ | $8.547 \pm 0.036^f$ | $8.425 \pm 0.058^e$ | $8.754 \pm 0.023^f$ |
| $T_{01}$ | $6.675 \pm 0.048^a$ | $6.654 \pm 0.043^a$ | $6.463 \pm 0.043^a$ | $6.576 \pm 0.058^a$ |
| $T_{02}$ | $8.476 \pm 0.037^f$ | $8.357 \pm 0.033^e$ | $8.512 \pm 0.033^f$ | $8.478 \pm 0.033^e$ |
| $T_1$ | $7.325 \pm 0.056^b$ | $7.426 \pm 0.045^b$ | $7.543 \pm 0.028^b$ | $7.345 \pm 0.023^b$ |
| $T_2$ | $8.143 \pm 0.045^c$ | $8.035 \pm 0.053^c$ | $8.216 \pm 0.043^c$ | $8.076 \pm 0.33^c$ |
| $T_3$ | $8.356 \pm 0.064^e$ | $8.148 \pm 0.033^d$ | $8.376 \pm 0.033^d$ | $8.216 \pm 0.023^d$ |

**The values are mean ± S.D. of three independent determinations ($p<0.05$). The mean values were compared at 5% level of significance. Mean values having different superscript letters are significantly different.**

## CONCLUSION

Based on analysis of milk and milk blends used in this study it can be concluded that a plant based milk prepared from combination of millet and coconut milk can be a good replacer of cow milk due to absence of allergens with better nutritional and sensory profile. Milk with good acceptable quality can be prepared from utilization of underutilized low cost cereal millet by incorporating coconut milk into it to enhance the sensory property of non dairy beverage. Millet milk is good source of minerals and coconut milk is abundant in fat, protein, vitamins and other nutrients along with a better mouth feel which justifies its combination with millet milk to produce a low cost value added plant based milk alternative. Thus millet-coconut milk can be the solution for the problems like malnutrition in poor countries where poor people can't afford highly nutritive food due to their high cost and for people suffering from other milk allergy and lactose intolerance. This was a pilot scale study and there is a great scope for further research in utilization of underutilized millet.

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