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Chemical composition of soy milk and coconut milk compare to goat milk fed to experimental kids

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Abstract
A study on "Substitute milk for early weaned Konkan kanyal kids" was carried out by using soy milk, coconut milk and goat milk. The attempts have been made to study effect of different levels of soy milk and coconut milk (25, 50, 75 and 100 %) on kid's growth. Goat milk with 50 per cent soy milk and goat milk with 25 per cent coconut milk was found superior over rest of the treatments.

Keywords: soy milk, coconut milk, goat milk, chemical composition

Introduction
Goat milk has benefits that it doesn't cause inflammation. That's a big reason why it is easier for people with bowel inflammation to drink goat milk, instead of cow milk. It is easier to digest and assimilate in the human body. The size of the fat globules in goat's milk is much smaller than those found in cow milk (Anonymous, 2017) [1].
Kids are non-ruminants at birth. For the first 7 to 14 days of life, kids fore stomach (with the exception of the abomasum) is poorly developed and it must rely on milk or milk replacers for nutrients (Sarker *et al*., 2015) [2].
Soya bean grain contains proteins with sulfhydril groups which play a very important role as antioxidants. Beside their role in trapping of free radicals and prevention of stress they could reduce trypsin inhibitors, such as Kunitz-trypsin inhibitor and phenolics, as main contributors of antioxidative activity in soya bean grain (Dragicevic *et al*. 2010) [3].
Soymilk is a creamy, milk-like product made by soaking and grinding soybeans in water. Soybean or soymilk has always been a rich source of protein which is inexpensive and abundantly available (Raja *et al*., 2014) [4].
Coconut milk is the aqueous emulsion of coconut kernel, which is prepared by hand or machine pressing fresh grated coconut kernel. Coconut milk has many culinary applications. Coconut milk is consumed directly or with cooked food. (Nadeeshani *et al*., 2015) [5].

Material and Methods
The present investigation was carried out to determine the substitute milk for early weaned Konkan Kanyal kids. The trial was conducted at Instructional farm of the Department of Animal Husbandry and Dairy Science, College of Agriculture, Dapoli.

Preparation of Soymilk
A total of 125 g of soya bean was roasted until the bean get brown colour. The roasted soya beans were cool under the room temperature for period followed by soaked at overnight in cold water. There after the beans was manually dehulled. Along with the dehulled soya beans 1 kg of luke warm distilled water were added and ground well. The mix was filtered through a muslin cloth to remove the solid particles and filtrate obtained was soymilk.
The Soy milk was prepared as per the procedure given by Pandian *et al*. (2012) [6] with slight modifications.

Preparation of coconut milk
To prepare coconut milk, coconut was cracked manually and the coconut grating was removed with a sharp knife. The brown part of the coconut grating was gently scraped off. It was cut into smaller pieces to enhance quicker blending. White shredded coconut (200g) was blended with 1 L of luke warm distilled water.

The suspension obtained was further diluted with 1 L of luke warm distilled water. Then it was sieved through muslin cloth. The filtrate obtained was coconut milk.

The Coconut milk was prepared as per the procedure given by Olubamiwa and Kolapo (2008) [7] with slight modifications.

Some preliminary trials were conducted to determine the range of Soy milk and Coconut milk for feeding to kids. The trials with four levels of Soy milk and Coconut milk (25, 50, 75 and 100 %) were selected on the basis of preliminary trials for further studies.

Results and Discussion

Common major nutrients need to be taken into consideration while formulating the diet. The nutrients present in the feeds indicate quality of the feed. The experimental feeds were analyzed for their chemical composition and results obtained are presented in Table 1.

Protein

Goat milk contain 3.5 per cent of protein, a little higher level of protein appears to be beneficial for kids. Protein is needed for growth, building up body fat, and for the essential body functions. Below minimum level of crude protein in the ration, feed intake is reduced leading to combining deficiency of almost all the nutrients. Long term protein deficiency leads to low weight and affects kid growth.

The average protein content of goat milk and milk substitute used for present investigation is presented in Table 1. The average protein content was highest in treatment (T_4) 100 per cent soymilk (4.003 %) and lowest in treatment (T_8) 100 per cent coconut milk (2.900 %), whereas, the treatment T_4 was significantly superior over all other treatments.

The finding of protein content of goat milk in present study was in accordance with Mahmoud *et al.* (2012) [8], Sabahelkhier *et al.* (2012) [9], and Ladokun and Oni (2014) [10] who reported 3.420, 3.300 and 3.217 per cent protein, respectively.

In present study crude protein content of soy milk was in accordance with values quoted by Akinnuli and Olabanji (2013) [11], Sarker *et al.* (2015) [2] and Shakeel *et al.* (2015) [12] which were 3.500, 4.000 and 4.790 per cent, respectively.

Protein content of coconut milk during present study was in accordance with Pichitvittayakarn *et al.* (2006) [13], Law *et al.* (2009) [14] and Ocansey (2010) [15] which were 2.990, 2.510 and 2.290 per cent, respectively.

Protein content increases with increase in level of soy milk in treatments T_1, T_2, T_3 and T_4 this might be due to goat milk replaced by soy milk with level 25, 50, 75 and 100 per cent and protein content of soy milk was higher (4.003 %) than goat milk.

Protein content decreases with increase in level of coconut milk in treatments T_5, T_6, T_7 and T_8 this might be due to goat milk replaced by coconut milk with level 25, 50, 75 and 100 per cent and protein content of coconut milk was lower (2.900 %) than goat milk.

It was revealed that average protein content vary significantly from control group this might be due to additional levels of different milk substitute. Nutritional quality of a milk replacer enhance due to protein enhancement. The statistical analysis showed that protein content with different treatments was significant.

Fat

Fat is a reserve source of energy for goats. Excess energy produced by carbohydrates is stored in the form of fat especially around internal organs. The stored fat in the body is used during high energy needs. Goat milk contains 4.5 per cent of fat. Coconut milk can be considered as an excellent source of antioxidants for health and has medicinal applications in fat digestion.

The goat milk and milk substitute used for present investigation was analyzed for fat content and results obtained are tabulated in Table 1. The average fat content was highest in treatment (T_8) with 100 per cent coconut milk (12.750 %) and lowest in treatment (T_4) with 100 per cent soy milk (2.825 %), whereas, the treatment T_8 was significantly superior over all other treatments.

Similar fat content of goat milk was earlier mentioned by Bhattarai (2012) [16], Mahmoud *et al.* (2012) [8] and Sabahelkhier *et al.* (2012) [9] which were 3.800, 4.300 and 3.900 per cent fat, respectively.

Sarker *et al.* (2015) [2] reported fat values of soy milk, 25 per cent whole milk with 75 per cent soy milk and 50 per cent whole milk with 50 per cent soy milk were 2.700, 4.350 and 3.750 per cent, respectively.

The findings of fat content in coconut milk during present study were in accordance with Pichitvittayakarn *et al.* (2006) [13], Olu *et al.* (2013) [17] and Ladokun and Oni (2014) [10] who reported 17.000, 18.840 and 15.020 per cent fat in coconut milk, respectively.

Fat content decreases with increase in level of soy milk in treatments T_1, T_2, T_3 and T_4 this might be due to goat milk replaced by soy milk with increasing levels with 25, 50, 75 and 100 per cent and fat content of soy milk was low (2.825 %).

Fat content increases with increase in level of coconut milk in treatments T_5, T_6, T_7 and T_8 this might be due to goat milk replaced by coconut milk with level 25, 50, 75 and 100 per cent and fat content of coconut milk was high (12.750 %).

It was evident from the table that average fat content vary significantly from control group because of additional levels of different milk substitutes. The statistical analysis showed that fat content with different treatments was significant.

Acidity

Perusal of results presented in Table 1 revealed that acidity of goat milk and milk substitute. The average acidity was highest in treatment (T_4) with 100 per cent soy milk (0.169 %) and lowest in treatment (T_5) with 75 per cent goat milk and 25 per cent coconut milk (0.136 %), whereas, the treatment T_4 was significantly superior over all other treatments.

Similar acidity of soy milk during present study was observed by Belewu and Belewu (2007) [18] and Masum *et al.* (2009) [19] which were 0.170 and 0.145 per cent, respectively.

Acidity content of coconut milk during present study was in accordance with Belewu and Belewu (2007) [18] which was 0.150 per cent.

Acidity in treatments T_1, T_2, T_3 and T_4 increases with increase in level of soy milk this might be due to goat milk replaced by soy milk with level 25, 50, 75 and 100 per cent and acidity of soy milk was rather high (0.169 %).

Acidity in treatments T_5, T_6, T_7 and T_8 increases with increase in level of coconut milk this might be due to goat milk replaced by coconut milk with level 25, 50, 75 and 100 per cent and acidity of coconut milk was rather high (0.151 %).

Total Solids

The total solids of goat milk and milk substitute used for present investigation are presented in Table 1. The average total solids content was highest in treatment (T_8) with 100 per cent coconut milk (16.415 %) and lowest in treatment (T_4)

with 100 per cent soy milk (10.520 %), whereas, the treatment T_8 was significantly superior over all other treatments.

In present study total solids content of goat milk was in accordance with Mahmoud *et al.* (2012) [8] and Sabahelkhier *et al.* (2012) [9] were 13.080 and 12.000 per cent total solids, respectively.

Sarker *et al.* (2015) [2] reported total solids values of soy milk, 25 per cent whole milk with 75 per cent soy milk and 50 per cent whole milk with 50 per cent soy milk were 10.700, 12.610 and 11.970 per cent, respectively.

Total solids of treatments T_1, T_2, T_3 and T_4 decreases with increase in level of soy milk this might be due to goat milk replaced by soy milk with level 25, 50, 75 and 100 per cent and total solids of soy milk was 10.520 per cent.

Total solids of treatments T_5, T_6, T_7 and T_8 increases with increase in level of coconut milk this might be due to goat milk replaced by coconut milk with level 25, 50, 75 and 100 per cent and total solids of coconut milk was rather high (16.415 %).

Ash

The inorganic matter remains after oxidation of organic matter is called as ash. The Ash content of goat milk is 0.8 per cent. The goat milk and milk substitute used for present investigation was analyzed for ash content and results obtained are tabulated in Table 1. The average ash content was highest in treatment (T_0) with 100 per cent goat milk (0.800 %) and lowest in treatment (T_8) with 100 per cent coconut milk (0.500 %). A comparable result of ash content of goat milk were also observed by Bhattarai (2012) [16] and Sabahelkhier *et al.* (2012) [9] which were 0.800 and 0.700 per cent ash, respectively.

In present study ash content of soy milk was in accordance with Belewu and Belewu (2007) [18], Masum *et al.* (2009) [19], Ladokun and Oni (2014) [10] and Sarker *et al.* (2015) [2] which were 0.660, 0.650, 0.570 and 0.600 per cent ash, respectively.

Ash content of coconut milk during present study was in accordance with Belewu and Belewu (2007) [18] and Ladokun and Oni (2014) [10] which were 0.510 and 0.520 per cent ash, respectively.

Ash content of treatments T_1, T_2, T_3 and T_4 decreases with increase in level of soy milk this might be due to goat milk replaced by soy milk with level 25, 50, 75 and 100 per cent and ash of soy milk was rather low as 0.600 per cent.

Ash content of treatments T_5, T_6, T_7 and T_8 decreases with increase in level of coconut milk this might be due to goat milk replaced by coconut milk with level 25, 50, 75 and 100 per cent and ash of coconut milk was rather low as 0.500 per cent.

Specific Gravity

Perusal of results presented in Table 4.1 revealed that specific gravity values of goat milk and milk substitutes. The average specific gravity was highest in treatment (T_0) with 100 per cent goat milk (1.030) and lowest in treatment (T_3) with 75 per cent soy milk and 25 per cent goat milk, (T_4) with 100 per cent soy milk and (T_8) with 100 per cent coconut milk (1.027).

In present study specific gravity of goat milk was in accordance with Ladokun and Oni (2014) [10] as 1.030.

The similar finding of specific gravity of soy milk was observed by Masum *et al.* (2009) [19] was 1.023.

A lower values of specific gravity of coconut milk than present study (1.027) were reported by Omotosho and Odeyemi (2012) [20] and Ladokun and Oni (2014) [10] which were 1.008 and 1.010, respectively.

Specific gravity of treatments T_1, T_2, T_3 and T_4 decreases with increase in level of soy milk this might be due to goat milk replaced by soy milk with level 25, 50, 75 and 100 per cent and specific gravity of soy milk was 1.027.

Specific gravity of treatments T_5, T_6, T_7 and T_8 decreases with increase in level of coconut milk this might be due to goat milk replaced by coconut milk with level 25, 50, 75 and 100 per cent and specific gravity of coconut milk was 1.027.

Table 1: Chemical composition of experimental feeds.

Treatments	Chemical composition					
	Protein (%)	**Fat (%)**	**Acidity (%)**	**Total solids (%)**	**Ash (%)**	**Specific Gravity**
T_0	3.525^{e}	4.550^{d}	0.142^{d}	12.923^{b}	0.800^{a}	1.030^{a}
T_1	3.625^{d}	4.074^{e}	0.143^{d}	12.320^{d}	0.753^{b}	1.029^{a}
T_2	3.750^{c}	3.653^{f}	0.155^{c}	11.725^{f}	0.703^{d}	1.028^{b}
T_3	3.823^{b}	3.244^{g}	0.160^{b}	11.125^{g}	0.648^{e}	1.027^{b}
T_4	4.003^{a}	2.825^{h}	0.169^{a}	10.520^{i}	0.600^{f}	1.027^{b}
T_5	3.350^{f}	4.143^{e}	0.136^{e}	12.077^{e}	0.723^{c}	1.029^{a}
T_6	3.200^{g}	6.713^{c}	0.145^{d}	12.305^{d}	0.650^{e}	1.028^{b}
T_7	3.050^{h}	9.056^{b}	0.147^{c}	12.695^{c}	0.570^{g}	1.028^{b}
T_8	2.900^{i}	12.750^{a}	0.151^{c}	16.415^{a}	0.500^{h}	1.027^{b}
SE ±	0.008	0.133	0.001	0.005	0.002	0.000
CD (P<0.05)	0.025	0.386	0.004	0.016	0.005	0.001

*Means with different superscripts differed significantly

Conclusion

On the basis of results this study concluded that there were no major differences between composition of treatment with goat milk, treatment with 50 per cent soy milk and 50 per cent goat milk and treatment with 25 per cent coconut milk with 75 per cent goat milk. From the result it may be concluded that the Soy milk and Coconut milk could be successfully utilized for feeding of kids. Therefore, from the present investigation the results revealed that replacement of goat milk with 50 per cent soy milk and 50 per cent goat milk or 25 per cent coconut milk and 75 per cent goat milk provides essential nutrients for growth and useful to improve growth performance, haemato-biochemical parameters, physiological performance of kids. Thus neonatal kids can be weaned by replacing goat milk with 50 per cent soy milk or 25 per cent coconut milk without any detrimental effect on their growth performance.

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