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PHYSICOCHEMICAL, SENSORY AND MICROBIAL ASSESSMENT OF NEWLY FORMULATED AND FORTIFIED YOGURT

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ABSTRACT

Yogurt is an ideal source of gut microbes. Newly formulated six yogurt samples apart from control were prepared using 10 % and 20 % of coconut milk as partial substitute of milk; followed by incorporation of date molasses (10 %, 15 % and 20 %). Samples were analyzed for physicochemical properties such as moisture, ash, fat, protein, total solids (TS), total soluble solids (TSS), pH, titratable acidity, total phenolic contents (TPC) along with microbial and sensory properties. pH, acidity and microbiological characteristics were examined on the 1st and 7th day (refrigeration at 4ºC). A significant ($p<0.05$) decrease in moisture content (ranged-69.06% to 76.12%) in enriched samples was observed in comparison with control (80.33%). Significant ($p<0.05$) positive effect of treatment in TS, TSS, fat, protein, ash and TPCs of yogurt samples had been noticed. pH and acidity for each treatment level were not significant ($p<0.05$) in paired comparison (1st day and 7th day) but the significant effect of treatments in pH and acidity ($p<0.05$) was marked. The total coliform count was observed as nil in control and experimental yogurt at 1st and 7th day (storage at 4ºC). For all developed samples, total viable bacteria count at 7th day was significantly higher than that of at 1st day (p-value < 0.05). However, these results were significantly lower than in controlled sample. Yogurt formulated using 10% coconut milk followed by 20% date molasses revealed significant higher value for taste, flavor and overall acceptability ($p<0.05$) but color and texture change were not significant ($p<0.05$)

1. Introduction

Food which contains components such as specific minerals, vitamins, fatty acids or dietary fibers that aid specific functions in the body in a targeted way so as to have positive effects on health can be said to be a functional food (Roberfroid, 2000). Those foods are developed for good health or to lessen the risk of diseases. Foods with added phytochemicals and those that can support beneficial microbial cultures of interest are within this kind (Ndife and Abbo, 2009). Yogurt is one of the widely used health beneficial fermented dairy product that can be produced by lactic fermentation of milk with *Streptococcus thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus*. Living microorganisms such as lactic acid bacteria (LAB), *streptococci*, *bifidobacteria* or their combinations, from the starter cultures are accountable for the quality of the product (Amerinasab *et al.,* 2015). Yogurts are varied in different regions of the world and types would be as full-fat, low-fat, non-fat, flavored, probiotic, frozen and drink yogurt (Fiszman *et al.*, 1999). People who are reasonably lactose intolerant can appreciate yogurt without unfriendly effects, as the lactose in milk precursor has been converted to lactic acid by the bacterial culture (Heyman, 2000). It also has medical uses because of the probiotic properties, in serving out on gastro intestinal situations and

in inhibiting antibiotic-associated diarrhea (Mazahreh and Ershidat, 2009). Yogurt was thought to encourage good gum health, supports the absorption of calcium, thus avoiding osteoporosis because of the probiotic effect of lactic acid in yogurt (Kerry *et al.,* 2001). Very recently incorporation of natural food additives and other substances that are supportive to health is highly promising. Development of such products was carried out by adding plant-based flavored syrups or concentrates to cultured milk (Gonzalez *et al.,* 2011).

Coconut milk which has high fat content is usually used in curries and other bakery products as a thickener. It is rich in nutrients such as vitamins (C, E) and minerals like iron, calcium, potassium, magnesium, and zinc and is a good source of fiber (Seow and Gwee, 1997). It has health benefits such as anti-carcinogenic, anti-microbial, anti-bacterial, and anti-viral. A most important constituent of it is saturated fat, lauric acid which is present in mother's milk and has been associated in promoting brain development (Belewu and Belewu, 2007). Lauric acid is also supportive in enhancing the immune system and keeping the elasticity of the blood vessels. Consumption of this milk is hardly accompanying with allergenic responses. Other benefits of coconut milk include: it helps in digestion, nourishes skin and has cooling properties (Sethi *et al.,* 2016). But the presence of saturated fats limits its consumption though it has other health benefits.

Yogurt formulated with fruit or vegetable mixtures provides improved nutritive functions and sensory attributes (Cakmakci *et al.,* 2014). Furthermore, such health promoted and highly preferred dairy products with date molasses or date liquid sugar was also reported (Amerinasab *et al.,* 2015). In Bangladesh, the sap of silver date palm, *Phoenix sylvestris* is tapped to be consumed fresh, or processed into either syrup or the jaggery known as "gur". It contains up to 50% sucrose, up to 20% invert sugars, and up to 20% moisture, with the remainder, made up of other insoluble matter, such as wood ash, proteins, and bagasse fibers. The harvested syrup (collected in clay pots suspended from notches cut in the trunk) is boiled down to get different stabilities ranging from liquid to solid. Most Bengali confectioners use such date molasses in making sweets during the winter months. The undying popularity of the molasses has also found in the literature and culture of the country of Bangladesh and Indian state of West Bengal (Banerji, 2012). In this vein, it was attempted to develop yogurt with different combinations of coconut milk and date palm molasses and to determine the effect of different concentrations of the value additions on their physicochemical, sensory, and microbial characteristics.

2. Materials and methods

The research was conducted in the Laboratories of the Department of Nutrition and Food Engineering, Daffodil International University, Dhaka, Bangladesh.

2.1. Materials

2.1.1. Chemicals

All required chemicals and solvents were collected from Sigma-Aldrich Chemical Co. (USA).

2.1.2. Samples

Fresh matured coconut and pasteurized cow milk were procured from the local market of Dhaka city. Freeze-dried starter culture of *L. bulgaricus* and *S. thermophilus* (CH1, Chr. Hansen's Dairy Cultures, Hoersholm, Denmark) were also purchased from a vendor in Dhaka city, Bangladesh. Date palm molasses without soda or any other stuff was collected from Pantapara village in Jessore's Khajura area, Bangladesh.

2.2. Methods

2.2.1. Coconut milk preparation

The de-husked coconuts were cracked open into halves. The split nuts were de-shelled, brown skin was removed and then washed. Then it was blended using an electric blender (Sanyo SM-B12M) with deionized water. Resultant was then sieved through a vibrating screen filter machine (SY 450) to get coconut milk and analyzed (moisture 70.02 %, fat 17.9 %, protein 2.30 % and ash 0.70 %) followed by refrigeration for further use.

2.2.2. Yogurt preparation

Date palm molasses used was standardized as ash 1.9%, moisture 39%, fat 0.3% and protein 0.62%. Milk and coconut milk (CM) were blended in 90:10 and 80:20 ratios and the resultants (milk with coconut milk 10% and 20%) were further blended with 10%, 15% and 20% date palm molasses (DM) to obtain six samples. Samples were labeled as CM-DM (10-10), CM-DM (10-15), CM-DM (10-20), CM-DM (20-10), CM-DM (20-15) and CM-DM (20-20). One sample with cow milk without coconut milk and date palm molasses was considered as control (C). All samples were heated to 85ºC for 15 min followed by rapid cooling to 45ºC. Culture (0.5 g) was then inoculated to each with gentle mixing. The inoculated samples were transferred to 100 ml plastic cups and incubated at 45°C for 4 hours to allow fermentation, hence rapid production of lactic-acid by the inoculated bacteria resulting in complete coagulation of the milk. All samples were stored in the refrigerator at 4°C for subsequent analysis.

2.2.3. Physico-chemical analysis

According to the Association of Official Analytical Chemists methods (AOAC 1999), percentage of moisture was determined by oven drying method to a constant weight. Total mineral content by dry ashing procedure using muffle furnace (Maurice and Marshall, 2010), percentage of crude protein by Kjeldahl nitrogen considering factor as 6.25 (Lynch and Barbano, 1999) and fat content by using Garber method (Kleyn, 2001) were determined. All these analyses were stated as grams per 100 g of fresh weight.

Total phenolics were determined by a spectrophotometric method using Folin – Ciocalteu reagent. 1.0 mL of sample solution extract in water containing 1.0 mg of sample was pipetted out into a flask. 46 mL of distilled water was then added to it followed by the addition of 1 mL of Folin Ciocalteu reagent with thorough mixing. 3.0 mL of 2 % sodium carbonate was added to the resultant after 3 min of mixing. Then it was incubated for 2 hours at ambient temperature and absorbance was measured at 760 nm using a UV – visible spectrophotometer (T-80, double beam). Concentrations were expressed as micrograms of Gallic acid equivalents (GAE) per 100 mg of fresh weight by using the following linear equation obtained from the calibration curve:

$A = 0.0166C + 0.0542$, $R^2 = 0.9994$, (A is the absorbance and C is concentration as GAE μg/mg).

Titratable acidity, pH and total soluble solids (TSS) were also determined. Total soluble solids (TSS) were determined by an ‘‘Atago, Japan’’ hand refractometer at 20° C. The pH value was determined using a Hanna (HI 8424) pH meter. Direct titration by sodium hydroxide (0.1 M) to a pH value 8.1 using a pH meter was used to measure titratable acidity (T.A) which was expressed as percent of Lactic acid (Jacobs, 1999). Total solids (TS) were calculated by taking into consideration the moisture content as TS = 100 – Moisture content.

2.2.4. Microbiological tests

Yogurt samples were studied by using the plate count agar for the total viable bacteria count and MacConkey agar for the coliform count. The colonies were counted and the result was expressed as colony-forming unit per ml (CFU/ml) (APHA 1978).

2.2.5. Organoleptic scoring

Sensory evaluation of yoghurt samples prepared with changed concentrations of coconut milk and date palm molasses was carried out with a panel of 10 members including graduate students and staff of the Nutrition and Food Engineering Department, Faculty of Allied Health Sciences, Daffodil International University who were accustomed to the typical attributes of samples, on 9-point hedonic scale for different parameters such as color, flavor, taste, texture and overall acceptability according to the suggested method (Ihekoronye and Ngoddy, 1985). Assessors were in sensory booths with proper lighting and requested to indicate on a questionnaire whether they can make comment between samples with regard to these parameters. Each sample was presented thrice, and the samples were presented in random order. This evaluation was based on hedonic 9-point structured scale, in which 9

corresponded to most liked and 1 to most disliked.

2.2.6. Ethical Issues

Sensory data was collected by providing prior knowledge to the assessors about the objectives of the study. An informed written consent was signed from the sensory evaluators before the test and was ensured that the products were made in the laboratory with maintaining proper hygiene and the materials used in preparing the products were free from any sort of health risk. The study received approval from the Research Ethical Committee of Faculty of Allied Health Sciences, Daffodil International University (Ref. No. FAHSREC/DIU/2019/1003).

2.2.7. Statistical Analysis

All analytical experiments were repeated in triplicates and the results reported as a mean of the values found with standard deviation. The obtained data were statistically analyzed by means of statistical tools such as one-way analysis of variance (ANOVA), Tukey's HSD test and Paired T-test with considering 5% significance level using R (Version 3.4.3, RStudio version: 1.1.383) software and Microsoft excel 2007 (version 12.0.4518.1014).

3. Results and discussions

3.1. Physico-Chemical characteristics

Considered physicochemical characteristics for the developed samples are depicted in Table 1 and Table 2. Moisture percentage of incorporated samples ranged from 69.06 to 76.12 whereas the value for control was 80.33. Significant ($p<0.05$) difference in moisture with different treatments was observed. This could happen due to varied compositions of milk substitutions in samples. Enriched samples had lower moisture percentage than the control ($p<0.05$) and yogurt samples with 10-20 and 20-20 treatments had the lowest moisture ($p<0.05$). The value decreased with an increased percentage of coconut milk and date palm molasses, as obtained (Gad *et al.,* 2010). However, less water content means more total solid content in yogurt and ensures more storage stability.

The total solids increased in samples developed with coconut-milk and date palm molasses had a significant effect of treatment on TS ($p<0.05$). Samples with 20-20 and 10-20 treatments had significantly higher values of TS than samples with other treatments ($p<0.05$). Increase in total solids may also have a positive impact on the texture of the resultant product reported (Abd El-Tawab, 2009).

As the total solids reflect samples dry matter content, samples developed with a high weight percentage of coconut milk and date palm molasses had the highest soluble solids content ranged from 11.32 % to 17.51 %. Significantly ($p<0.05$) highest TSS value in yogurt samples of 20-20, 10-20 treatments and significantly lowest TSS value in control can be explained by considering the impact of sugars from coconut milk and date palm molasses incorporation (Belewu *et al.,* 2010; Hamdia and Hamdani, 2016).

Protein content in the developed samples was in the range of 4.21% to 4.92%. Supplemented samples had a significant positive effect of treatment ($p<0.05$) on protein content. Yogurt of 20-20 treatment had the highest protein level ($p<0.05$) whereas control had the lowest protein level ($p<0.05$).

The Fat percentage of incorporated samples varied in between 6.92 to 6.98 whereas the value for control was 5.19. The significantly high fat content of amended samples ($p<0.05$) from control was found but there was no significant change of fat percentage with the variation of date palm molasses and coconut milk. It has been reported that fat % has a positive impact on the sensory and physical attributes of yogurt though it has a negative effect on the shelf life of yogurt (Bille and Keya, 2002; Farinde *et al.*, 2009; Marinescu and Pop, 2009; Saint-Eve *et al.,* 2008)

Ash percentage of yogurt without coconut milk and date palm molasses was 0.51 but the value for the developed samples was increased and it was in the range of 0.61 to 0.90. Significant effect of treatment on ash content ($p<0.05$) with the highest ash content in samples of 10-20 and 20-20 treatments were observed while the control had the lowest ash content

($p<0.05$). Ash content significantly ($p<0.05$) increased as percentage of date molasses increased. The increased ash percentage of the enriched samples can be attributed from the incorporation of coconut milk and date palm molasses as coconut milk and date palm molasses are of high mineral content (Imele and Atemnkeng, 2001; Marinescu and Pop, 2009). More ash content in the samples is in line with the results from coconut incorporated yogurts (Ndife *et al.*, 2014).

Table 1. Physicochemical attributes of developed samples as a function of coconut milk (CM) and date molasses (DM) content *

Attributes	Treatment (CM-DM)						
	Control	**10-10**	**10-15**	**10-20**	**20-10**	**20-15**	**20-20**
Moisture	80.33 ±0.17^{a}	76.12 ±0.23^{b}	73.19 ±0.18^{d}	69.16 ±0.31^{e}	75.25 ±0.07^{c}	73.10 ±0.20^{d}	69.06 ±0.10^{e}
Protein	3.81 ±0.27^{e}	4.21 ±0.14^{d}	4.26 ±0.13^{c}	4.48 ±0.35^{b}	4.76 ±0.11^{b}	4.84 ±0.16^{b}	4.92 ±0.25^{a}
Fat	5.19 ±0.19^{b}	6.92 ±0.29^{a}	6.95 ±0.25^{a}	6.97 ±0.28^{a}	6.96 ±0.23^{a}	6.92 ±0.32^{a}	6.98 ±0.25^{a}
Ash	0.627 ±0.193^{c}	0.627 ±0.193^{b}	0.657 ±0.04^{b}	0.903 ±0.042^{a}	0.613 ±0.176^{b}	0.66 ±0.061^{b}	0.86 ±0.154^{a}
TSS	7.73 ±0.03^{f}	11.32 ±0.03^{e}	14.59 ±0.04^{c}	17.42 ±0.1^{a}	11.52 ±0.04^{d}	15.06 ±0.08^{b}	17.51 ±0.02^{a}
TS	19.67 ±0.17^{e}	23.88 ±0.23^{d}	26.81 ±0.18^{b}	30.84 ±0.31^{a}	24.75 ±0.07^{c}	26.9 ±0.2^{b}	30.94 ±0.1^{a}
TPC	0.04 ±0.003^{d}	1.09 ±0.002^{c}	1.762 ±0.002^{b}	2.05 ±0.003^{a}	1.095 ±0.004^{c}	1.763 ±0.003^{b}	2.05 ±0.002^{a}

*Values in the same columns followed by different letters (a, b, c, d, e) are significantly different ($p<0.05$)

Table 2. pH and acidity of newly formulated samples as a function of coconut milk (CM) and date molasses (DM) content *

Attributes	Treatment (CM-DM)						
	Control	**10-10**	**10-15**	**10-20**	**20-10**	**20-15**	**20-20**
pH	4.412 ±0.022^{d}	4.412 ±0.022^{c}	4.452 ±0.017^{c}	4.513 ±0.022^{b}	4.528 ±0.026^{b}	4.528 ±0.021^{b}	4.602 ±0.018^{a}
Acidity	0.672 ±0.015^{a}	0.65 ± 0.02^{b}	0.625 ± 0.024^{c}	0.595 ± 0.021^{d}	0.63 ± 0.021^{c}	0.608 ± 0.025^{d}	0.605 ±0.018^{d}

*Values in the same columns followed by different letters (a, b, c, d, e) are significantly different ($p<0.05$)

Significant difference between the paired data (1st day and 7th day) for both pH and acidity for each treatment level was not observed. pH and titratable acidity values of the produced yogurts are depicted in Table 2. Yogurt without coconut milk and date palm molasses were ascertained as pH 4.4. Food Standard code for pH of yogurt was reported as a maximum of 4.5 to avoid the growth of any pathogenic organisms (Donkor *et al.*, 2006). pH value of amended samples was in between 4.41 and 4.60. Sample of 20-20 treatment had significantly different pH ($p<0.05$) followed by the value for a sample of 10-20 treatment ($p<0.05$). pH value of enriched samples would be lower than that of control as there was the lower possibility of the production of lactic acid from milk sugar lactose due to the presence of lower proportion of milk in enriched

samples. However, such an increase of pH is in line with the addition of mulberry juice to yogurt which led to the higher pH value of the product (Celik and Bakirci, 2003).

Titratable acidity ranged from 0.60% to 0.65% in the incorporated samples though control had value 0.67%. Such lower acidity due to the incorporation of coconut milk and date palm molasses is also in line with the reverse change of pH and titratable acidity. Enriched samples showed a significant effect of treatments on acidity ($p<0.05$). In particular, significantly lower value for a sample of 10-20 treatment was detected.

Total phenolic contents in the developed samples were found more than the plain yogurt (0.04 μg GAE/ mg of yogurt) and it was ranged 1.09 to 2.05 μg GAE/ mg of fresh weight. Treatment had a significant effect ($p<0.05$) and TPCs were significantly higher in samples amended as 10-20 and 20-20 ($p<0.05$). Products developed with coconut milk had positive significant change from control but there was no significant increase of the TPCs of the products developed with a variation of the proportion of coconut milk by 10% to 20%. As the proportion of date molasses in the yogurt samples was increased, TPCs were significantly increased. Phenolic contents are plant secondary metabolites and are key components of human diets for their antioxidant properties.

3.2. Organoleptic characteristics

Mean score given by the considered panelists for each sensory attributes of all developed yogurts are in short in Table 3 and Fig.1. Control yogurt had the lowest score (5.9±1.1) and (6.3±1.16), while samples with treatment had the higher score (ranged 6.0±1.25 to 7.4±1.26) and (ranged 6.5±0.71 to7.2±1.4) for color and texture respectively. The statistical analysis showed that there were no significant differences ($p<0.05$) among the control and treated yogurt samples in the color and texture observed. Sample of 10-20 treatment had highest scores of 8.1±0.88 and 7.9±0.99 for both taste and flavor, while control sample had the lowest scores of 5.9±0.99 and 5.9±0.74 for taste and flavor respectively.

Table 3. Sensory traits of the developed yogurts as a function of coconut milk (CM) & Date molasses (DM) content *

Sensory Attributes	Treatment (CM-DM)						
	Control	**10-10**	**10-15**	**10-20**	**20-10**	**20-15**	**20-20**
Color	5.9 ±1.1^{a}	6.0 ±1.25^{a}	6.7 ±1.57^{a}	7.4 ±1.26^{a}	6.7 ±1.42^{a}	7.0 ±2.0^{a}	6.2 ±2.57^{a}
Taste	5.9 ±0.99^{c}	6.7 ±0.82^{b}	6.8 ±0.92^{b}	8.1 ±0.88^{a}	6.7 ±1.34^{b}	6.9 ±1.97^{b}	6.8 ±1.87^{b}
Flavor	5.9 ±0.74^{c}	6.5 ±0.71^{c}	6.8 ±1.03^{b}	7.9 ±0.99^{a}	6.4 ±0.52^{c}	6.5 ±0.97^{c}	6.9 ±1.73^{b}
Texture	6.3 ±1.16^{a}	6.5 ±0.71^{a}	6.6 ±0.7^{a}	7.2 ±1.4^{a}	6.5 ±1.27^{a}	6.7 ±1.83^{a}	7.1 ±1.6^{a}
Overall acceptability	6.5 ±0.53^{C}	6.7 ±0.68^{b}	6.9 ±0.74^{b}	7.5 ±0.97^{a}	6.4 ±0.7^{c}	6.8 ±0.79^{b}	7.3 ±1.06^{b}

*Values in the same columns followed by different letters (a, b, c) are significantly different ($p<0.05$)

Table 4. Microbiological characteristics of yogurt samples *

Treatment (CM-DM)	TVC (CFU/ml)		TCC (CFU/ml)	
	1st day	7th day	1st day	7th day
Control	8.2×10^5 $\pm 0.42426\times10^{5\,a}$	9×10^5 $\pm 0.84852\times10^{5\,a}$	Nil	Nil
10-10	5.85×10^5 $\pm 0.35355\times10^{5\,b}$	7.25×10^5 $\pm 0.49497\times10^{5\,b}$	Nil	Nil
10-15	5.65×10^5 $\pm 1.20208\times10^{5\,b}$	6.4×10^5 $\pm 0.70710\times10^{5\,b}$	Nil	Nil
10-20	5.4×10^5 $\pm 0.70710\times10^{5\,b}$	5.75×10^5 $\pm 1.06066\times10^{5\,c}$	Nil	Nil
20-10	6.2×10^5 $\pm 0.42426\times10^{5\,b}$	6.55×10^5 $\pm 0.49497\times10^{5\,b}$	Nil	Nil
20-15	4.8×10^5 $\pm 0.14142\times10^{5\,c}$	6.1×10^5 $\pm 0.14142\times10^{5\,c}$	Nil	Nil
20-20	5×10^5 $\pm 0.70710\times10^{5\,c}$	5.75×10^5 $\pm 0.35355\times10^{5\,c}$	Nil	Nil

*TVC-Total viable bacteria count; TCC- Total coliform count; Data are mean values of duplicate determinations ± standard deviation; Values in the same columns followed by different letters (a,b,c) are significantly different ($p<0.05$)

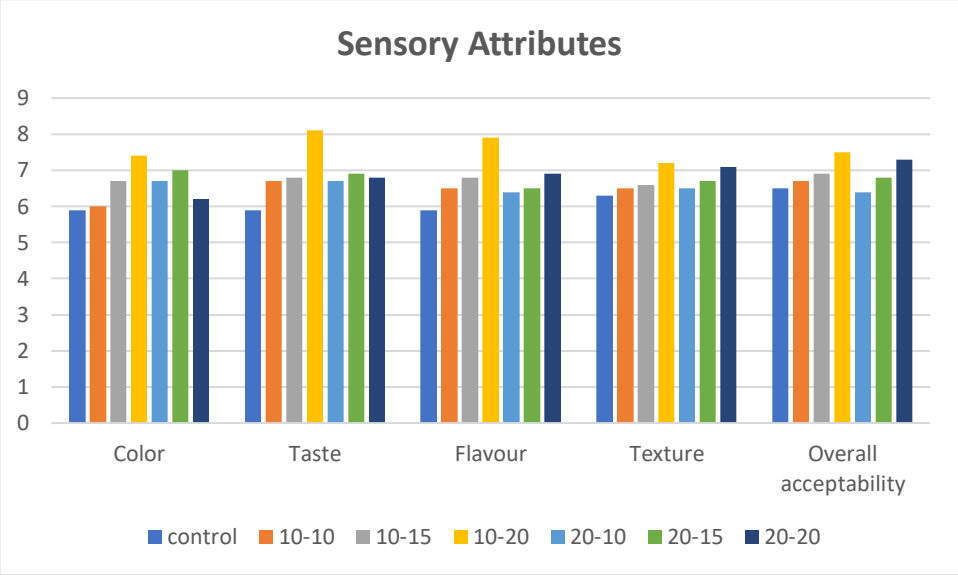

Figure 1. Graphical presentation of the mean of sensory attributes of developed samples as a function of coconut milk (CM) & Date molasses (DM) content

The high taste and flavor values could be due to increased oil content and sweetness from coconut milk and date palm molasses. Enriched yogurt supplemented with 20-20 treatment had lowest overall acceptability rating (6.4±0.7) whereas yogurt with 10-20 treatment had highest value (7.5±0.97) for the same. Yogurts supplemented with coconut-cake and date liquid syrup was reported as better samples with the high score of sensory attributes such as texture, aroma, flavor, sweetness and overall acceptability (Amerinasab *et al.*, 2015; Ndife *et al.*, 2014). However, product with 10-20 treatment revealed significant higher value for taste, flavor and overall acceptability ($p<0.05$).

3.3. Microbial assessment

Microbial characteristics by considering TVC and TCC at 1st and 7th day of processing (stored at 4ºC) were shown in Table 4. No growth of coliform bacteria (TCC) indicates that samples were free from contamination during production and storage. A significant difference in the paired data (1st day and 7th day) for TVC in control and each treatment level was observed. TVC at 7th day was significantly higher than TVC at 1st day (p-value < 0.05). Significant (p-value < 0.05) lower growth of total viable bacteria in all the developed samples than the control was observed. This can be explained by taking into account the antimicrobial effect of date palm molasses as the antimicrobial properties of date palm were noticed (Hamdia and Al-Hamdani, 2016). Such degeneration in the viable bacterial count may arise due to increased acidity of enriched products (Abd El-Tawab, 2009). However, the total viable bacterial load of the samples was acceptable as the standard of microbial status is $<1x10^6$ CFU/ml (El Bakri and Zubeir, 2009).

4. Conclusions

Nowadays, fermented dairy product consumption is growing particularly for its brilliant nutritious and remedial properties. Coconut milk and date molasses as natural and nutritive improver would be healthier supplements for yogurt. Results showed that moisture content of enriched yogurt particularly samples with treatment 10-20 and 20-20 are of low value where TS, TSS, fat, protein, ash, and TPCs of those yogurt samples were found as high value than the control sample. pH and acidity of supplemented samples were found significantly different from the control sample. Organoleptic scoring of the sample with 10-20 treatment is high in terms of taste, flavor, and overall acceptability, but the color and texture of the samples were not shown as significantly different. The total viable bacterial count of formulated samples was of lower value than that of yogurt without treatment. It can be concluded from the study that the yogurt prepared by incorporation of 10 percent coconut milk followed by 20 percent date molasses boosted physicochemical, organoleptic, and nutritive characteristics along with the presence of reasonable total viable bacterial growth in the product. In all considerations, this enriched yogurt would be an alternative functional product for its upgraded characteristics. Due to the short period of time, the sensory evaluation was carried out with a smaller number of assessors. More study is needed for other microbial characteristics and to find out antioxidant properties of the newly formulated yogurt.

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