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Physical and Sensory Evaluation of Peanut Yogurt

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ABSTRACT

The word "yogurt" is related to the Turkish word "jaukurt" which means thick milk. Yogurt refers to a fermented milk product made by using selected microorganisms to develop not only the characteristic flavor but also body and texture. Peanut is one of the important nutrients which has significant amount of all essential nutrients. **Objective:** In this study physical and sensory properties of peanut yogurt are evaluated by using different scientifically proved sensory evaluation methods. **Methods:** The whole process of manufacturing and evaluating peanut milk yogurt was conducted in National Institute of Food Science and Technology, University of Agriculture Faisalabad. After washing and soaking peanuts in water for seven straight hours at room temperature, the peanuts were subjected to be used to prepare peanut milk. This process was followed up by grounding the peanuts in water. The resultant slurry thus produced was centrifuged with cheese cloth. After heating the product at 90°C for 15 minutes, physical and sensory properties were assessed. Modified centrifugation process was used for the determination of syneresis. **Results:** By concluding the organoleptic analysis, the yogurt demonstrated impact of storage and treatments on different sensory metrics with advancing degradation in flavor, body, texture, and appearance of yogurt. During the study, complete parameters/metrics and minimal alterations were all noticed in the yogurt throughout the study. While conducting treatments, maximum percentages were given to different treatments including 1% sugar, 9% skimmed milk powder, 80% skimmed milk liquid, and 10% peanut milk. With various recent examinations and studies, it has been reported that the treatment T_1 with 10% peanut milk is better for production of peanut milk yogurt as compared to other treatments. T_2 with 1% sugar, 9% skimmed milk powder, 20% peanut milk, and 70% skimmed milk liquid and peanut milk yogurt with 1% sugar, 9% skimmed milk powder, 30% peanut milk, and 60% skimmed milk liquid showcased deteriorated firmness and organoleptic acceptance. **Conclusion:** Upon completion of the study, it was determined that the presence of fat, total solids, and protein content in the milk produced by peanuts impact the magnitude of serum separation and pH of yogurt, affecting texture and entire yogurt acceptability.

INTRODUCTION

In most countries yogurt is popular cultured dairy product all the time. On the subject of possible health benefits of yogurt, this is to some extent due to a better responsiveness of customers. Yogurt is enriched with protein, fat, phosphorus, calcium etc. which has a high nutritional value, easily digestible, and its role in total phosphorus intake has been reported as 33-44 %. During fermentation, yogurt is milk based product which can digest quickly due to presence of milk protein, lactose and fat components undertake fractional hydrolysis [1]. Between various milk products manufactured through fermentation, that may include butter milk, acidophilus milk, sour cream, ropy milk, and cheese owing, yogurt is possibly the most popular one because of its refreshing aroma, flavor, and creamy consistency [2]. Fermented foods offer a wide range of texture, flavor and aroma to improve the value of human diet. More than 3500 fermented foods are distributed all over the world [3]. For production of peanut milk yogurt mostly research has been done on utilization of fermentation techniques for

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extraction of peanut milk in the presence of lactic acid bacteria. Moreover, the presence of extensive nutty and whey flavor may turn the whole thing into an unsuitable product for yogurt substitution [4]. Peanut has an important role in fighting against malnutrition due to its phytochemical and nutrient content [5]. A yogurt-like product (Dahi) was profitably produced using lactic cultures with miltone (derived by supplementing spray-dried peanut protein isolates with animal milk). Although, the fermentation in the involvement of L. acidophilus NRRL B-1910 and L. bulgaricus NRRL B-1909 develops a custard like texture in peanut milk but extreme amount of whey can make the product unpleasant. The ever-changing norms of consumers for natural products owes to the developing comprehension on human health ailment because of synthetic additives. In food systems different types of additives are in use i.e. coloring agents, flavoring agents and variety of preservatives. Antioxidants play a major role in scavenging free radicals for the mitigation of oxidation processes, marking them as important additives as compared to others [6]. Despite of the inferior quality of peanut milk yogurt as compare to that of yogurt from cow milk it is consumable and had good textural properties and its overall acceptability scores were also satisfactory. In yogurt production, S. thermophilus and L. bulgaricusas starter cultures are required for fermentation. Due to this reason, for development of proper color and flavor, interaction between starter cultures and their individual characteristics are of much importance [7]. According to the main characters i.e. texture is the only one which defines the yogurt quality [8]. –examined the effects of several attributes and ingredients on the preference and sensory perception of the yogurt. It was noted that acidity played an important role in aroma and flavor of the yogurt as compared to acetaldehydes like 2,3-pentanedione and diacetyle [9]. – observed the physical characteristics and shelf-life of yogurt made of corn milk. They compared physico-chemical, microbiological characteristics and shelf-life of corn milk and cow milk yogurt (CMY). Results of this study recommend that corn milk is a prospective raw material for making an innovative yogurt. The corn milk yogurt had low fat contents [10], protein with harder and higher consistency than CMY. The physical appearance, color and flavor of corn milk yogurt and commercial yogurt were not much different. The main flavor compounds of CMY were tridecane, tetradecane, dodecane and heptyl methyl ketone whereas those of corn milk yogurt were tridecane, ethyl oleate, tetradecane, ethyl linoleate [11]. Viscosity or firmness plays an important role in determining the quality and acceptability of the yogurt without syneresis. The firmness of the yogurt is affected by the source of milk and the yogurt with higher total solids and protein content has higher firmness or viscosity. Viscosity also affects the mouth feel and texture of fluid [12]. The sensory properties can be adversely affected by various possibilities, among them is an increased number of stabilizers which can change flavor and make the overall texture over-stabilized, giving a gel-like mouthfeel. While comparing peanut yogurt, it can be produced without the need of added solids or stabilizers having solids content of 16-18 % in the milk[13]. The consistency and brittleness level of yogurt could be achieved by changing fat and protein levels. Protein component was used most effectively to enhance consistency. The yogurt having large protein components (7.39 %) created less number of pores and have lower syneresis as compared to lower protein yogurts [14]. The fortification of the peanut milk for manufacturing of yogurt milk was done by 4g/100g skimmed milk powder and 12g/100g total solids. These were later subjected for physiochemical assessment by leveraging CMY as control for the study. When compared to CMY peanut milk yogurt has higher content of protein, water holding capacity [15], fats and unsaturated fatty acids also higher than saturated ones [16].

METHODS

Procurement of raw materials: Peanuts, raw milk, skimmed milk, sugar and chemicals (Lactobacillus bulgaricus and Streptococcus thermophilus) are the materials that were used for this study. All these materials were purchased from the local market with a care that all the materials should be of good quality. Peanut milk yogurt was manufactured and analyzed in the Laboratory of National Institute of Food Science & Technology, University of Agriculture, Faisalabad. Preparation of peanut milk: Firstly, peanuts were washed and soaked in water for seven hours at room temperature. Then peanuts were grounded followed by water which was twice of peanut weight. Peanut milk was obtained by filtering the resultant slurry through centrifugal separator with a double layered cheese cloth. It was heated for 15 min at 90 °C. Physical and sensory properties were determined by following methods. Yogurt syneresis was evaluated from the centrifugation process, conducted with a couple of alterations. The liberation of watery-whey like liquid on the surface of the gel is termed as syneresis. 200g of yogurt sample (Y) was taken and prepared inside a centrifuge cup which was then subjected to centrifugation for 10 minutes at 2500 RMP with an average 640xg at 4°C. The weight of the expelled whey content (W) was analyzed and then eliminated while the syneresis was examined by the following formula; [17]

$$\text{Synersis}(\%) = \frac{W}{Y} \times 100\%$$

Apparent viscosity of yogurt was determined at 10 to 15ºC and the obtained yogurt was then agitated for more than 40

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seconds prior to measuring the overall viscosity.

With a rotation of around 10 RPM, spindle 4 was utilized for the previously described measurement. Two units of reading were used, a) percent torque and b) centipoises (cP) for taking the Viscometer reading. Yogurt samples were evaluated for color, flavor, body/texture and overall acceptability using 9-point hedonic scale by the panel of researchers from the faculty members at the National Institute of Food Science and Technology, University of Agriculture, Faisalabad [18]. The data obtained for each parameter was subjected to statistical analysis under factorial design using completely randomized design (CRD). Interaction was carried out up-to two ways. Statistix 8.1 software was used to analyze data statistically according to the method described by [19].

RESULTS

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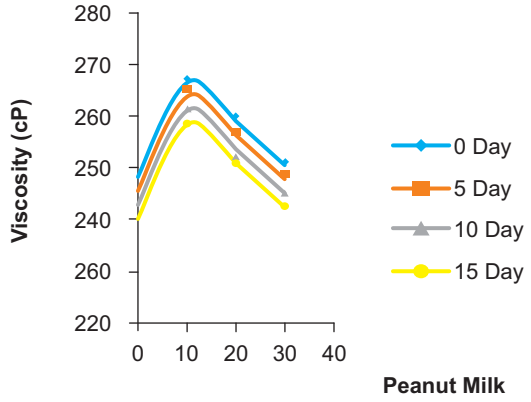

Figure 1: Effect of different treatments of PM and storage days on viscosity of PMY

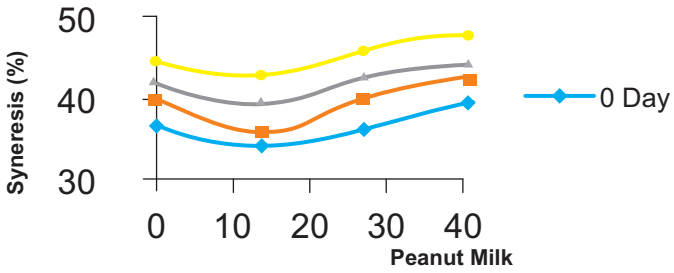

Figure 2: Effect of different treatments of PM and storage days on syneresis

Treatments	Storage (Days)				Means
	0	5	10	15	
T_0	8.37±0.41	7.92±0.39	7.65±0.38	6.75±0.33	7.67±0.37a
T_1	7.92±0.39	7.47±0.37	7.2±0.36	6.93±0.34	7.38±0.36b
T_2	6.84±0.34	6.48±0.32	6.57±0.32	5.76±0.28	6.41±0.31c
T_3	6.39±0.31	6.03±0.30	6.3±0.31	5.31±0.26	6.00±0.29d
Means	7.38±0.36a	6.97±0.34b	6.93±0.34b	6.18±0.30c	

Table 1: Mean value of color and appearance during storage

ABC, similar alphabets on means in column do not vary in a great deal at P≤0.01

ABCD, similar alphabets on means in row do not differ significantly at P≤0.01

Treatments	Storage (Days)				Means
	0	5	10	15	
T_0	8.57±0.42a	8.13±0.40ab	7.92±0.39abc	7.12±0.35de	7.93±0.39a
T_1	8.13±0.40ab	7.48±0.37bcd	7.2±0.36de	6.33±0.31fg	7.28±0.36b
T_2	7.2±0.36de	7.06±0.35cde	6.69±0.33ef	5.97±0.29g	6.73±0.33c
T_3	6.98±0.34def	6.33±0.316fg	5.90±0.29g	5.68±0.28g	6.22±0.30d
Means	7.72±0.38a	7.25±0.35b	6.92±0.34c	6.27±0.30d	

Table 2: Mean value of flavor during storage

a-g, similar alphabets on means do not differ significantly at P≤0.05

ABCD, similar alphabets on means in column do not differ significantly at P≤0.01

ABCD, similar alphabets on means in row do not differ significantly at P≤0.01

Treatments	Storage (Days)				Means
	0	5	10	15	
T_0	7.99±0.39	7.56±0.37	6.98±0.34	6.04±0.30	7.14±0.35a
T_1	7.48±0.37	7.41±0.37	6.55±0.32	5.68±0.28	6.78±0.33b
T_2	6.91±0.34	6.37±0.31	6.26±0.31	5.18±0.25	6.18±0.31c
T_3	6.19±0.30	5.83±0.29	5.26±0.26	4.96±0.24	5.56±0.27d
Means	7.14±0.35a	6.79±0.33a	6.26±0.30b	5.46±0.26c	

Table 3: Mean value of body and texture during storage

ABC, similar alphabets on means in column do not differ significantly at P≤0.01

ABCD, similar alphabets on means in row do not differ significantly at P≤0.01

DISCUSSION

The results regarding the viscosity of peanut milk yogurt under various treatments during storage exposed that viscosity decreased in peanut milk yogurt through entire period of storage due to increase of shear rate. The peptide

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chains of peanut milk proteins are unfolded with high temperatures, which may cause the change in the nature of the protein and viscosity altered [20]. The apparent viscosity of yogurt was extremely affected by the content of total solids of yogurt, it was observed that with an increase in the total solids there was a change in apparent viscosity [2]. The viscosity or firmness of peanut milk yogurt samples under various treatments decreased during storage. At zero day the highest firmness/viscosity values were observed (267.33 cP) in yogurt sample T1 of 10% peanut milk and minimum value (251.33cP) was observed in yogurt sample T3 of 30% peanut milk. After 15 days of storage minimum decrease in viscosity value (8.66) was observed in peanut milk yogurt sample T2 of 20% peanut milk. Changes in viscosity were graphically showed in fig1. The statistical analysis showed that the change in viscosity was highly significant for treatments as well as storage and their interaction was non-significant. The main defect of yogurt which should be overcome during storage is the whey separation. The syneresis of yogurt under various treatments increased due to increase in acidity during storage. The increase in syneresis might be due to rearrangement of protein network resulting from changes in pH, acidity and temperature during storage of yogurt. The results regarding the syneresis of yogurt under various treatments during storage are shown in fig 2, which showed that syneresis increased in yogurt through storage period. The increase in syneresis values after 15 days of storage were from40.54 to 45.87, 38.93 to 44.75, 40.33to 46.93and 42.47 to 47.99for 0% peanut milk to 30% peanut milk respectively. The statistical analysis demonstrated that the results were highly significant for treatments, storage days and their interaction during storage. All samples of prepared peanut milk yogurt were organoleptically evaluated at 0, 5, 10 and 15days intervals using 9-point hedonic scale. Five judges were provided with printed Performa. The data collected on organoleptic evaluation i.e. flavor, body, texture and appearance was associated with quality and the acceptability of cultured dairy products as affected by storage are discussed below. Color and Appearance: The data on the appearance of peanut milk yogurt under various treatments during storage is given in Table1. The mean score for appearance decreased like other characteristics during storage. The mean score for appearance after 15 days' storage decreased from 8.37 to 6.75 for T0, 7.92 to 6.93 for T1, 6.84 to 5.76 for T2 and 6.39 to 5.31 for T3 respectively. The data in Table 4.19 showed that there was maximum decrease in the scores for appearance T1 while T2 got maximum score. The appearance of yogurt is also affected due to increase in yeast and mold counts in yogurt during storage, which ultimately deteriorates the quality of yogurt. Flavor is a combined perception of taste, smell and mouth feel [21]. When it is requested to give comments on the flavor of the two yogurts, some judges cherished the PMY flavor upon that of CMY but the most judges favored the CMY flavor. These indications recommend that if we improve the flavor of PMY, then PMY turn out to be more satisfactory and appealing to prospective customers. The data on flavor scores of yogurts under various treatments as affected by storage is shown in Table 1.2. The mean flavor scores of yogurts decreased during storage [22]. It is evident from the results of Table 1.3 that T1 containing 10% peanut milk got the maximum scores for flavor during storage period of 15 days. The overall texture refers to being bite resistant and chewy. Texture can be easily simplified by adjusting the mixture proportion, preparation, and freezing. In organoleptic evaluation, the body and texture of the product is the second most important factor. The level of protein present in milk affects the consistency of yogurt; hence the fortification is very important. The data on body and texture scores of peanut milk yogurts under various treatments during storage is shown in Table 1.3. The mean value body and texture scores for yogurt samples were decreased during storage conditions. The mean body and texture scores after 15 days' storage decreased from 7.99 to 6.04 for T0, 7.48 to 5.68 for T1, 6.91 to 5.18 for T2 and 6.19 to 4.96 for T3. T1 got highest points for body and texture while T3 got least points because of its delicate structure and very hard curd. The least decrease in body and texture during storage was also observed in T1.

CONCLUSION

Organoleptic evaluation of yogurt showed that storage as well as treatments administered major impact on all sensory parameters and a progressive deterioration in flavor, body & texture and appearance of yogurt under various preparatory treatments and storage time.

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