

Study on The Physio-Chemical Composition of Industrial (Hotel, Sweet Shop, Milk Vending Shop) made Dahi Karachi Sindh Pakistan

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Abstract

The four hundred samples of industrial and conventional made Dahi samples were studied for their physio-chemical and organoleptic properties. hundred samples of industrial yoghurt designated as "A" were collected from Karachi (Dairy fresh yoghurt manufactured dairy food industry Pvt ltd Karachi. while 300 samples of conventional made Dahi were obtained from different sources of Tando Jam and Hyderabad city designated as "B" (hotel) "C" (Sweet shop) and "D" (milk vending shops) made Dahi. According to the statistical analysis no significant difference was found in Ph values and acidity percentage amongst all types of Dahi samples, but significant difference was observed in fat and total solid percentages. the lowest fat percentage was recorded from the sample "A" with an average of 2.48 ± 0.050 , while Dahi sample of "C" showed highest fat percentage with an average 5.071 ± 0.123 . The highest total solid % with an average of 13.81150 ± 0.20178 were recorded from samples "C" and lowest from sample Yoghurt with an average of 12.3468 ± 0.120 . According to the results of organoleptic evaluation the maximum score maximum score given by the panel of judges to sample "C" followed by samples of A, B and D.

Keywords: Dairy technology. Milk, Sweet, Vending.

Introduction

Yoghurt or Dahi is a fermented and coagulated milk product with a smooth texture, having mildly sour taste and pleasant flavors. It is obtained posturized or boiled milk by souring natural or otherwise using lactic acid fermenting bacteria that is streptococcus, thermophilus and lactobacillus, bulgaricus (FAO-1977). The commercial yoghurt of today is usually made by fermenting milk with mixed culture of streptococcus, thermophilus and lactobacillus bulgaricus. Each of these organisms acidify the milk and produce specific

yoghurt flavor and aroma. Dahi is a counterpart of yoghurt, the most popular cultured milk product of Endo Pakistan having its own physical chemical microbiological and organoleptic qualities (Davis-1975). It is prepared from cow's, buffalo's and skim milk. The method of manufacturing of Dahi in Pakistan is classified into two types those manufactured on industrial scale and those prepared by traditional method, which is most prevalent and is adopted in homes and milk vending shops but its quality is of sub-standard and variable due to number of factors that include use of low quality milk, unsuitable starter culture, unfavorable incubation temperature and contamination from badly cleaned utensils (Rice-1952) there is a lack of uniformity in the methods of preparation of this indigenous fermented milk product, it is usually made from cows and buffaloes milk. The milk is boiled in an open container for about 5-10 minutes, cooled to 45 degree and transferred to prewashed earthen pots inoculated with 3-5 % of previous day's Dahi as a starter culture , this starter culture is a mixture of unclassified lactic acid bacteria along with contaminants and incubated at room temperature for-overnight , in winter the temperature is controlled by wrapping with a warm cloth, thus the quality of Dahi is unpredictable and may fail to produce the desired product (naeem and rizwi, 1983). The physio-chemical characteristics, acidity, PH, taste, flavor and consistency are the primary importance of yoghurt, in this respect a few states have established standard of commercial yoghurt. The USA food and drug administration had advanced an opinion that a maximum titratable acidity of 0.5% is essential for fresh and frozen yoghurt based on industry practice and traditional characteristic of these foods. According to Pakistan official milk and dairy product 1974 Dahi mean a product obtained by lactic acid fermentation of pure milk, it shall contain not less than 3.5 % of milk fat but not less than 5% from the milk of buffalo and shall not contain less than 9% total solid other than milk fat.

Many systematic studies have been done on the standardization of methods for the quality checking the physio-chemical and organoleptic properties conventionally manufactured Dahi, standards 1948 but very little information is available on the actual nature of these products with reference to pH, acidity and total solid percentage. The present study was therefore designed to analyze the samples of different brands of industrial and conventionally made Dahi, sold in the local market and to compare physio-chemical composition and organoleptic properties.

Material And Methods

Collection of Samples

Sample of different brands / types of industrial and indigenous made yoghurt Dahi such as industrial yoghurt (dairy fresh yoghurt manufacture by dairy food industries (pvt) ltd Karachi), hotel , sweet shop and milk vending shop made Dahi were collected and brought to dairy technology laboratory of faculty of animal husbandry and veterinary sci. Sindh agriculture university Tando Jam were analyzed for their organoleptic properties , pH, acidity, fat and total solid percentage.

Table No.1 Showing Number of Yoghurt/Dahi Sample Collected from Different Sources.

| Serial no | Brand /types of yoghurt | Code no. | No. Of samples collected |
|-----------|-------------------------|----------|--------------------------|
| 1 | Industrial yoghurt | A | 100 |
| 2 | Hotel Dahi | B | 100 |
| 3 | Sweet meat shop Dahi | C | 100 |
| 4 | Milk vending shop | D | 100 |

Methods

Dahi samples were collected from different place/sources industrial yoghurt was brought from Karachi and Dahi samples from (hotel, sweet shop and milk vending shops) were brought from Hyderabad and Tando Jam.

Physical Analysis

The organoleptic examination was performed by the panel of judges for physical appearance consistency/texture, flavor and aroma. The panel of judges used hedonic scale 1-5 for scoring Dahi samples.

Chemical Analysis

All the Dahi samples were put in four parallel glass beakers for thorough mixing and to make uniform consistency by stirring with the help of electric stirrer for 1-2 minutes. Each sample was analyzed for the following parameters. pH was recorded with pH meter HANNA instruments Hi 8417 (microprocessor pH meter) made in Italy. Titratable acidity percentage was determined using method of Doan (1975) by titrating the sample with N/10 NaOH solution using phenolphthalein as an indicator. The acidity was expressed in terms of lactic acid percentage. Fat percentage was determined by Gerber method. Total solids percentage was determined by evaporation method as suggested by Jacobson (1936).

Results and Discussion

Experimental Results

Four hundred samples of four different types (100 samples for each type) of commercial/industrial yoghurt and conventional Dahi available in the local market were collected from different sources and were analyzed for their organoleptic properties, pH value, acidity percentage, fat percentage and total solids percentage.

Organoleptic Evaluation

Organoleptic evaluation of each sample of yoghurt/Dahi were put before the panel of four judges for organoleptic examination to judge the physical appearance, consistency/texture, flavor and aroma. They used hedonic scale 1-5 (Warsy 1982). The usual criteria for product quality on this scale has, that the product getting score from 0 to below 3 was defective and unremarkable. A marketable product must get a score of 3 or more. As the product quality improves the score increases from 3-5.

Table .2 Mean Value of Organoleptic Examination of Four Different Types of Yoghurt

| Types of yoghurt | Physical appearance | Consistency | Flavor and aroma |
|------------------------|---------------------|-------------|------------------|
| Industrial yoghurt | 3.2 | 3.0 | 2.5 |
| Hotel Dahi | 3.5 | 4.0 | 4.0 |
| Sweet shop Dahi | 4.0 | 4.5 | 4.5 |
| Milk vending shop Dahi | 3.8 | 4.0 | 4.2 |

The result of organoleptic examination of present study shows in table-2 that the mean value of industrial made yoghurt, got the average score of judging 3.2 n physical appearance, 3.0 in consistency and 2.5 score n flavor and aroma. Industrial yoghurt has got the lowest score than all the three other types of Dahi, sweet shop made Dahi got the highest score which is given by panel of judges i.e. in physical appearance score 4.0, consistency/texture 4.5 and flavor and aroma 4.5 as compare to all the other three types of yoghurt/Dahi, while hotel made Dahi got the score in physical appearance 3.5, consistency 4.0, flavor and aroma 4.0. The last one milk vending made Dahi have got the score in physical appearance 3.8, consistency 4.0 and flavor and aroma 4.2. The Histogram Showing pH Values of Four Different Types of yoghurt/Dahi Samples in the figure-1.

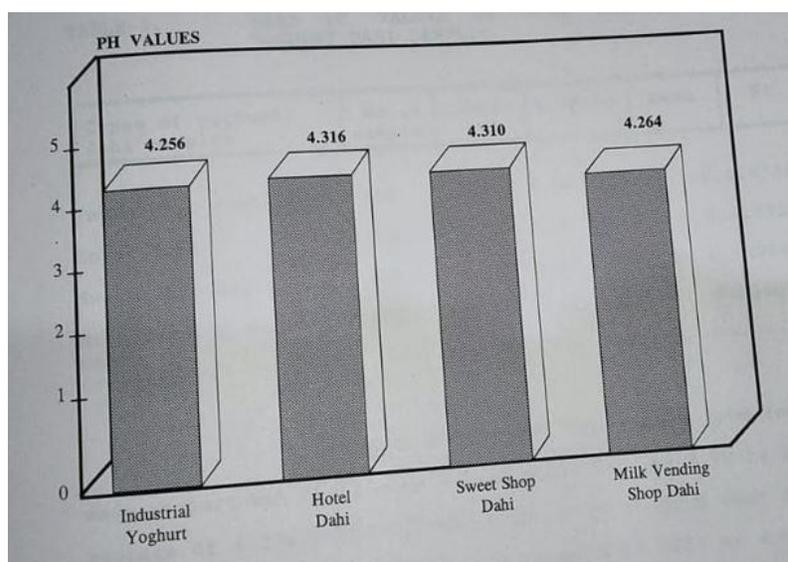


Fig-1 Histogram Showing pH Values of Four Different Types of yoghurt/Dahi Samples

The pH values as the result of pH values of four different types of Yoghurt/Dahi samples are summarized in Table.3.

Table.3 Mean Ph values of four different types of yoghurt/Dahi samples

| Types of yoghurt/Dahi samples | Number of samples | Lowest | Highest | Mean | St. E |
|-------------------------------|-------------------|--------|---------|---------|-------|
| Industrial yoghurt | 100 | 4.99 | 3.79 | 4.2561 | 0.018 |
| Hotel Dahi | 100 | 4.82 | 3.70 | 4.3168 | 0.019 |
| Sweet shop Dahi | 100 | 4.90 | 3.72 | 4.31020 | 0.020 |
| Milk vending shop | 100 | 4.76 | 3.18 | 4.2649 | 0.023 |

The results showed that the sample from industrial made yoghurt had the highest pH value range between 4.99 to 3.79 with average of 4.25 ± 0.018 while the milk vending shop Dahi lowest pH value ranged from 4.76 to 3.18 with an average of 4.26 ± 0.02305 . Hotel made Dahi had similar pH value ranged from 4.8 to 3.70 with an average of 4.3168 ± 0.019929 as that of Dahi from sweet shops ranged between 4.90 to 3.72 with an average of 4.310 ± 0.020 . Analysis of variance given in Table-4 showed that there were no significant different meaning pH values of different types of yoghurts.

Table. 4 Analysis of Variance of Data on pH Value of Four Types of Yoghurt /Dahis.

| Source of variation | Sum of square | D.F | Mean square | F Ratio | Sig-level |
|---------------------|---------------|-----|-------------|---------|-----------|
| Between groups | 0.286950 | 3 | 0.9565 | 2.243 | 0.082 |
| Within groups | 16.886450 | 396 | 0.042642 | - | - |

Titrateable Acidity

The results of titrateable acidity of four different types of Yoghurt are summarized in Table-5. While the Histogram Showing Acidity Percentage of four different types of Yoghurt/Dahi Samples in the figure-2.

Table.5. Mean Value of Acidity Percentage in Four different types of Yoghurts/Dahi

| Types of yoghurts | Number of samples | Max. | Min. | Mean | St. E |
|--------------------|-------------------|------|------|--------|---------|
| Industrial yoghurt | 100 | 1.71 | 0.60 | 0.88 | 0.01755 |
| Hotel Dahi | 100 | 1.80 | 0.60 | 0.912 | 0.0272 |
| Sweetshop Dahi | 100 | 1.54 | 0.50 | 0.852 | 0.01714 |
| Milk vending shops | 100 | 1.73 | 0.88 | 0.9031 | 0.0226 |

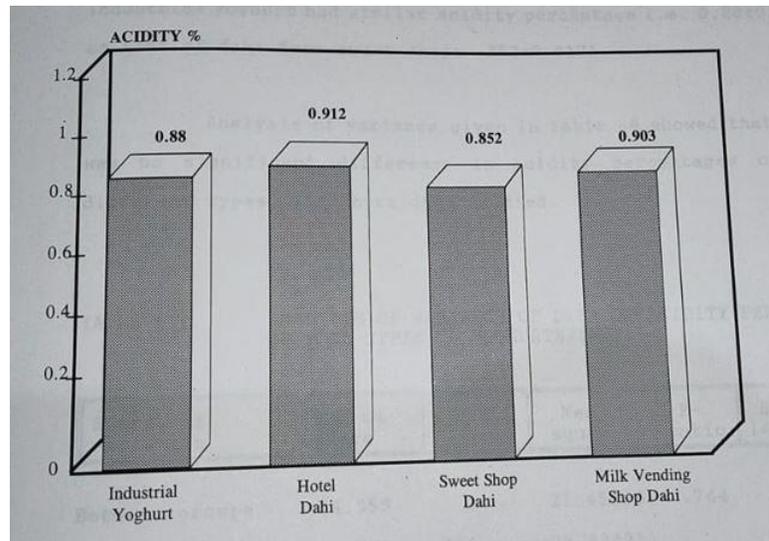


Fig.2 Histogram Showing Acidity Percentage of four different types of Yoghurt/Dahi Samples

According to the results of present study hotel made Dahi samples showed the highest acidity percentage with mean values 0.912 ± 0.1755 followed by Dahi sample from milk vending shop with mean values 0.903 ± 0.0226 . Dahi samples from sweet shops had the lowest acidity percentage with mean values 0.852 ± 0.01714 , while industrial yoghurt had similar acidity percentage i.e. 0.88 ± 0.01755 as that of Dahi from sweet shops 0.852 ± 0.0171 . Analysis of variance given in table-6 showed that there was no significant difference in acidity percentages of four different types of yoghurt/Dahis studied.

Table. 6 Analysis of Variance of data on Acidity Percentage of four types of Yoghurts/Dahis.

| Source of variation | Sum of square | D.F | Mean square | F Ratio | Sig-Level |
|---------------------|---------------|-----|-------------|---------|-----------|
| Between groups | 64.359 | 3 | 21.453081 | 0.744 | 0.5262 |
| Within groups | 11414.388 | 316 | 28.824211 | - | - |

Fat Percentage

The results of fat percentage of four different types of yoghurts are summarized in Table-7.

Table.7 Mean Value of Fat Percentage in four different types of Yoghurt/Dahi Samples

| TYPES OF YOGHURT | NO. OF SAMPLES | MAXI. | MINI | MEAN | St. E |
|------------------------|----------------|-------|------|--------|-----------|
| Industrial yoghurt | 100 | 3.72 | 1.20 | 2.48 | 0.0504891 |
| Hotel Dahi | 100 | 8.04 | 3.00 | 4.6098 | 0.1042917 |
| Sweet shop Dahi | 100 | 10.00 | 3.14 | 5.071 | 0.1233624 |
| Milk vending shop Dahi | 100 | 8.40 | 2.04 | 4.888 | 0.1027751 |

The result of the present study revealed the highest fat percentage was recorded from the Dahi samples obtained from sweet shop range between 10 and 3.14 percent with an average of 5.071 ± 0.1233624 . amongst all types of Dahis, while the industrial made yoghurt yielded the lowest fat percentage ranged between 3.72 and 1.2 % with an average of 2.48 ± 0.54819 . Milk vending shop made Dahi had similar fat percentage with an average of 4.88 ± 0.1027 as that of Dahi samples from hotels 4.60 ± 0.1042 . Analysis of variance given in Table-8 showed that there was a significant difference in the fat percentages of four different types of yoghurt/Dahis studied.

Table.8. Analysis of Variance of data on Fat Percentage in four types of Yoghurts/Dahis

| Source of variation | Sum of square | D.F | Mean square | F-Ratio | Sig-Level |
|---------------------|---------------|-----|-------------|---------|-----------|
| Between groups | 433.45784 | 3 | 144.48595 | 147.409 | 0.00 |
| Within groups | 388.14838 | 396 | 0.98017 | | P<0.05 |

Further analysis of data by DUNCAN multiple range test showed that fat percentage in type –A (industrial yoghurt) was significantly lowest ($P<0.05$) then all the three other types. Fat percentage in group-C (sweet shop Dahi) was significantly higher than other three types. While type-B (hotel Dahi) and D (milk vending shop Dahi) had similar percentage that is not significant. The histogram showing fat % of four different types of yoghurt/Dahi Samples mentioned in the figure-3.

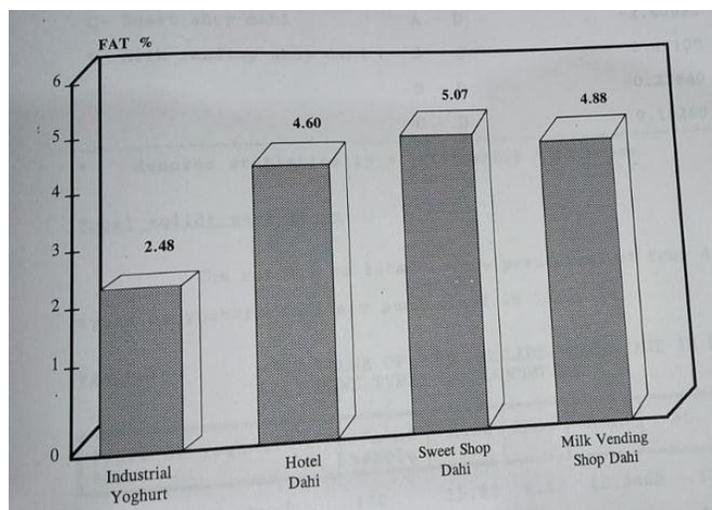


Fig-3 HISTOGRAM SHOWING FAT % FOUR DIFFERENT TYPES OF YOGHURT/DAHI SAMPLES

Table.9. Multiple Range Analysis for Fat Percentage of four different types of Yoghurt /Dahi samples

| Code No | Contrast | Difference |
|------------------------|----------|------------|
| Industrial Yoghurt | A – B | -2.12750 * |
| Hotel Dahi | A – C | -2.58850 * |
| Sweet shop Dahi | A – D | -2.40590 * |
| Milk vending shop Dahi | B – C | -0.46100 * |
| - | B – D | -0.27840 * |
| - | C – D | 0.18260 |

* Denotes statistically significant differences

Table.10 Mean Value of Total Solid Percentage of four different types of Yoghurts Are Summarized

| Types of yoghurt | No. Of samples | Maxi. | Mini. | Mean | St. E |
|------------------------|----------------|-------|-------|----------|-----------|
| Industrial yoghurt | 100 | 15.82 | 8.13 | 12.3468 | 0.1202419 |
| Hotel Dahi | 100 | 19.87 | 9.10 | 13.3923 | 0.1621373 |
| Sweet shop | 100 | 22.70 | 9.00 | 13.81150 | 0.201784 |
| Milk vending shop Dahi | 100 | 17.54 | 9.00 | 13.6112 | 0.142050 |

The results of this study showed that the sample from sweet shop made Dahi had revealed the highest total solids percentage ranged between 22.70 to 9.00 with an average of 13.81150 ± 0.201784 , while the industrial made yoghurt yielded the lowest total solids percentage ranged between 15.82 and 8.13% with an average of 12.3468 ± 0.1202419 . Hotel made Dahi had similar total solids percentage with an average of 13.3923 ± 0.1621373 as that of Dahi samples made from milk vending shop with an average of 13.6112 ± 0.142050 . Analysis of variance given in table-11 showed that there was a significant difference in total solids percentage of four types of yoghurt/Dahi sample studied. The histogram shows total solids percentage of four different types of yoghurt/dahi samples in figure-4.

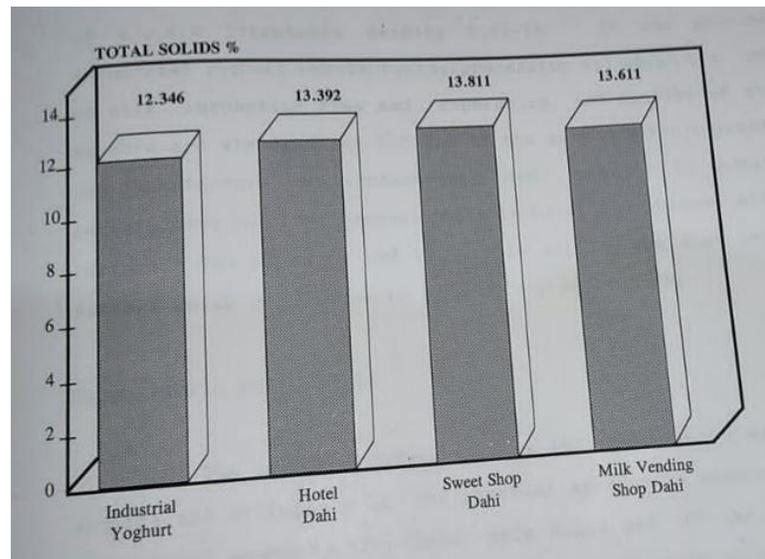


Fig-4 Histogram Showing Total Solids % Four Different Types of Yoghurt/Dahi Samples

Table.11. Analysis of Variance of data on Total Solids Percentage of four types of Yoghurt/Dahis.

| Source of variation | Sum of square | d.f | Mean square | F-ratio | Sig-level |
|---------------------|---------------|-----|-------------|-----------|------------|
| Between groups | 127.5222 | | 3. | 42.507414 | 16.800.000 |
| Within groups | 1001.9355 | 396 | 2.530140 | | |

Further analysis of data by Duncan multiple range test showed that the total solids percentage in type A (industrial yoghurt) was significantly lower ($p > 0.05$) than all the other three types. Comparison between B and C, B and D, C and D showed no significant difference.

Dahi are present in (table -5). The analysis of variance showed that there was no significant difference in the acidity percentage of four different types of Yoghurt /Dahi samples studied in (Table -6). During fermentation process of Dahi, starter culture bacteria multiply and convert lactose (milk sugar) into lactic acid, which plays an important role in the production of organoleptic properties of yoghurt. The tetra table acidity of good Dahi as reported by Davis (1975) should be around 0.85 to 0.90. The results of the present study are also similar that ranges between 0.88 to 0.90. The results of the other workers Sukumar (1980) reported that the desirable acidity of Dahi sold for direct consumption should be in between 0.75 to 0.85. However, the results of the present study are not in agreement with the investigation of Warsy (1982) Mohanan et al (1984). Tariq Masud et al (1988) their investigation showed higher percentage than the acidity 0.98 to 1.1 from different conventional made Dahi sample. This difference may be due to the procedure of Dahi making, milk quality and starter culture composition

Fat Content

The mean values of fat percentage of Dahi samples of all types of A, B, C and D showed significantly different $P < 0.5$, industrial yoghurt "A" yielded lowest fat contents, while samples from sweet shop Dahi yielded highest fat percentage. The other two types of B and D showed similar fat percentage. Industrial yoghurt, which is usually made from standardized UHT processed milk contains 3.5% fat. This hypothesis is supported by Kazmi (1983) and Khan et al. (1983) they recorded fat content from 2.58-3.54% from different brands of industrial processed milk for Dahi making. The high percentage of fat content from type c of Dahi was due to use of buffalo milk in the manufacturing of Dahi. The dominant difference between buffaloes and cow's milk is the percentage of high fat contents. While the type B and D showed similar fat contents. This type of Dahi is also prepared usually from buffalos' milk, but the low-fat contents showed that milk is Ethier partially skimmed or adulterated with water. other worker Chen et al .(1982) and Smaczny (1982) Abou -Donia et al. (1984) warsy (1982) and Satramdad (1984) also support the results of present study.

Total Solids Contents:

The results of the present study showed significantly difference between all types of dahi A,B,C and D.the highest content of total solids were recorded from "C" type of dahi "A" type was significantly ($P, 0.50$ lower than all other types i.e due to use of different types of milk .the results also agree with the results of other worker i.e Chapman et al . (1974) who reported that commercial yoghurt of U.K is usually made from 16-17% total solids. Abodu-Donia et al. (1984) who reviewed the Egyptian culture milk product a traditional yoghurt and found 16% total solids. Warsy (1982) and Satramdas (1984) also reported similar results from traditional made Dahi samples.

Summary

Samples of four different type of industrial yoghurt/indigenous dahi (hotel,sweet shops and milk vending shops) made dahi were collected and analyzed for their physico-chemical and organoleptic properties. The mean values for organoleptic evaluation showed that sweet shop dahi had highest score while industrial yoghurt was in lowest category amongst all four types. The results of the present study showed that the industrial made yoghurt had highest ph value, which ranged between 4.99 to 3.79 with an average 4.26 ± 0.12 while samples of dahi from milk vending shops yielded lowest. The ph values 4.76 to 3.18 with an average of 4.26 ± 0.23 . dahi samples obtained from hotel and sweet shops approximately produced same ph values ranged between 4.82 to 3.70 with an average of 4.32 ± 0.02 and sweet shop made dahi ranged between 4.90 to 3.72 with an average of 4.31 ± 0.02 . The analysis of variance of the results of the present study showed that there was no significant difference in ph values of four different types of dahi sold in the market. Furthermore, these results revealed that the highest percentage of acidity with mean value of 0.91 ± 0.27 was recorded from hotel made dahi followed by dahi samples from milk vending shops with mean values of

0.90±0.02. While the samples from industrial yoghurt and sweet shops made dahi showed with an average of 0.88±0.02 and 0.85±0.17 respectively. The analysis of variance showed that there was no statistically significant difference in the percentage of four types of dahi /yoghurt. According to the results of the present study the highest fat percentage with mean values of 5.07±0.12 was recorded from sweet shop made dahi followed by samples from milk vending shops of 4.88±0.12 and hotel made dahi sample with an average of 4.60±0.1043, While yoghurts samples from industrial yoghurt yielded from lowest fat percentage than other three types of dahi which averaged 2.48±0.50. The analysis of variance showed that there was a significant difference in the fat percentage of four different types of dahi samples studied. The industrial yoghurt significantly yielded less ($P<0.05$) than all the three other types. Fat percentage of sweet shops' dahi was significantly higher than other three types. While hotel and sweet shops made dahi samples showed non-significant differences in between. The highest total solids percentage were recorded from dahi samples obtained from sweet shops with an average of 13.82±0.22 while industrial yoghurt showed lowest with an average of 12.3468±0.12 percent. The other two types showed similar percentage of total solid 13.39±0.16 and 13.61±0.14 respectively from hotel and milk vending shops. According to the statically analysis there was a significant in the percentage of the total solids among all types of dahi sample studies. Industrial yoghurt was significantly lowest in total solids ($p>0.05$) than other three types while other types showed no significant difference. It is conferred and concluded from the above study following conclusion can be ascended. The 1st trial yoghurt sold in the market having less solids and fat contents than prescribed under Pakistan official standards of milk and dairy products. Amongst all the samples tested for physical chemical composition, and organoleptic evaluation dahi samples obtained from sweet shop were more acceptable by the panel of judges as these had more total solids percentage as compared with other dahi samples.

Conflict of Interest

The authors declare that there are not any potential conflicts of interest regarding the publication of this paper.

Data availability

The data used to support the findings of this study are included within the article.

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