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Physiochemical properties and sensory evaluation of mish "A traditional fermented dairy product" processed from different whey levels

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Authors' Contribution | **Omer, AOA., A.M.E. Sulieman** & **Y.H. Elhashmi** measured the physicochemical properties of mish samples. **A. A.T. Aldar**, **M. Adalla** & **E. Mohammed** conducted the research on sensory evaluation of mish samples.

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ABSTRACT

The current study looked at the chemical composition and sensory evaluation of Mish manufactured by different whey levels during storage. Samples o Mish were manufactured (day one) from five different levels of whey (A, B, C, D, and E), transported to the laboratory in an ice box, and stored at 7° C for 14 days. Samples were analyzed for total solids, moisture, ash, crude protein, fat, pH, acidity, and sensory evaluation (texture, flavor, color, and taste) at 1, 7, and 14 days. Fat, protein, total solids, ash, acidity, and pH were all higher in A and E, except for moisture, which was higher in E and lower in A. Except for total solids, moisture, fat, protein, ash content, and pH declined to a minimum at day 14, whereas acidity increased to a maximum at day 14. Toward the end of storage, the fat content in E declined little while increasing in A. Protein content decreased in E towards the end and climbed in A. At the conclusion of storage, total solids and ash concentrations fell somewhat in all treatments, while acidity increased in all treatments. The sensory evaluation results showed that the first treatment (A) was improved on all treatments. At the same time, during the storage periods, the production on day one was a preference, then after seven days, then after 14 days.

Keywords: Mish, whey levels, chemical composition, sensory evaluation, storage period.

INTRODUCTION: Dairy products are high in proteins, calcium, potassium, phosphorus, magnesium, zinc, and several B vitamins like riboflavin, niacin, vitamin B6, and B12 (Oskar *et al.*, 2004). Dairy products are any products made from milk. One of the oldest food preservation methods, dairy fermentation breaks down sugar and protein to produce a variety of organic compounds that improve flavor, preservation, and appearance. Fermentation can improve food safety and security, prolong shelf life by protecting and preserving foods, add flavor and nutritional value, and produce needed physicochemical qualities (Caplice and Fitzgerald, 1999). Mish is a fermented milk food that is popular throughout Sudan. Black cumin, red pepper, fenugreek, and cumin seeds are fiery herbs used to make mish at home. It is allowed to pick for two to three days after being salted before being processed for ingestion (Caplice and Fitzgerald, 1999). Milk whey is a highly nutritious by-product obtained from the dairy industry producing cheese, constituting almost 45-50% of total milk solids, 70% of milk lactose, 20% of milk proteins, 70-90% of milk minerals, and almost all the water-soluble vitamins initially present in milk. About 50% of worldwide whey is dumped by-products (Bohora, 2018).

OBJECTIVES: The purpose of this study was to chemically examine the fermented dairy product "mish" produced locally using five levels of whey throughout a 14-day storage period.

MATERIALS AND METHODS: From November to December 2020, this study was carried out at the Department of Dairy Production, Faculty of Animal Production, University of Gezira.

Sample collection: Mish samples were produced from five different amounts of whey: A (0% whey), B (25% whey), C (50% whey), D (75% whey), and E (100% whey), then carried to the laboratory in an ice box and stored in the refrigerator (7°C) for 14 days. Total solids, moisture, ash, crude protein, fat, pH, titratable acidity, and sensory evaluation (texture, flavor, color, and taste) were measured at 1-, 7-, 1, 7, and 14-day intervals.

Chemical analysis: The Gerber method was used to measure fat content, whereas the Kjeldahl method was used to evaluate protein content (Baur and Ensminger, 1977). The total solids content was calculated using the modified (Baur and Ensminger, 1977) method, as follows: three grams of Mish were placed in a clean dried flat-bottomed aluminum dish and cooked in a steam bath for ten minutes. The plates were dried in an oven at 100 degrees Celsius for three hours before being moved to a desiccator to cool before being weighed. The process of heating, chilling, and weighing was done multiple times until the difference between two successive weighings was less than 0.5 mg. The total solids content was calculated as follows:

$TS\% = W1\ X\ 100/W2$

W1 = Weight of sample before drying

W2 = Weight of sample after drying

Moisture was determined using the Caessens *et al.* (1997). The ash content was assessed using the Chemists (1925).

Physical analysis: Elfaki *et al.* (2015) was used to evaluate the titratable acidity. A thermo-scientific digital pH meter was used to measure the pH.

Sensory evaluation method: A sensory evaluation exam based on a 5-point hedonic scale. A hedonic rating is a technique used by unskilled evaluators to determine the degree of liking for a product. A hedonic scale design was used to explicate the texture, flavor, color, and taste of the control and the four experiments by 30 panelists. Prior to tasting the stuff. Panelists were asked to rate the sample's "texture, flavor, color, and taste using a 5-point hedonic scale ranging from "5-Excellent; 4-good, 3-medium; 2-acceptable; 1-lousy." Every pan list got the five formulations to be judged side by side, as well as water for rinsing. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS, version 23). For statistical analysis, a completely randomized design was adopted. At p0.05, the Duncan Multiple Range Test separated the means. Sensory evaluation was analyzed using descriptive analysis.

RESULTS AND DISCUSSION: Mish's chemical composition is shown in table 1 and figure 1. Whey content had a substantial impact on total solids, moisture, crude protein, fat, and ash. A had the highest fat content (3.30±0.024), whereas E had the lowest (2.10±0.024). Protein content in A was high (5.43±0.027) and low (3.80±0.027). The total solids content of A (15.100.100) was higher than that of E (11.07±0.100). The highest ash c level was found in A (1.42±0.019), while the lowest was found in E (0.58±0.019).

Factor A (Whey levels)	Total solids	Moisture	Crude protein	Fat	Ash
A (0%)	15.10[a]	84.90[e]	5.43[a]	3.30[a]	1.42[a]
B (25%)	14.25[b]	85.75[d]	4.88[b]	3.02[b]	1.32[b]
C (50%)	13.63[c]	86.48[c]	4.62[c]	2.72[c]	1.12[c]
D (75%)	11.90[d]	88.10[b]	4.17[d]	2.33[d]	0.87[d]
E (100%)	11.07[e]	88.93[a]	3.80[e]	2.10[e]	0.58[e]
±S.E	0.100	0.082	0.027	0.024	0.019
Sig	**	**	**	**	**
Factor B (Storage Period)					
One day	11.17[c]	88.81[a]	5.96[a]	3.89[a]	1.21[a]
Seven days	13.55[b]	86.45[b]	4.85[b]	2.76[b]	1.09[b]
Fourteen days	14.85[a]	85.24[c]	2.92[c]	1.43[c]	0.88[c]
±S.E	0.077	0.064	0.021	0.019	0.015
Sig	**	**	**	**	**
Factor A and Factor B					
±S.E	0.173	0.143	0.047	0.042	0.033
Sig	**	**	**	**	**

Table 1: Effect of different whey levels and storage period on chemical composition of Mish.

a-e Mean within column with different superscript letter are

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significantly different at p<0.01, S.E Standard Error, Sig Significant Level of significance ** : p<0.05.

table 1 also displays the chemical composition of Mish after 14 days of storage. The fat content declined steadily from day one (3.89±0.019) to a minimum at day 14 (1.43±0.019), after which it decreased (p0.001). The chemical composition results contradicted the findings of Mutlag and Hassan (2008), who showed maximum fat and total solids at 21 days of Labneh preservation. When compared to the value at the commencement of storage (which was 5.960.021), the protein content rapidly declined to a minimum at day 14 (2.920.021) (p0.001). The total solids content followed a different pattern, with protein content peaking at day 14 (14.85±0.077) and then falling to (11.17±0.077) at the start (p0.01). The ash content reduced from 1.210.015 on the first day to 0.880.015 at the end (p0.001). During storage, the moisture content decreased from day one to a maximum on day 14. These results followed Sulieman *et al.* (2011). Table 2 showed that the whey levels significantly affected the Acidity and pH of Mish. The highest t Acidity content was in A (4.63±0.033), while the lowest was in E (4.17±0.033). The pH content was high in A (4.20±0.033) and low in E (3.47±0.033).

The Acidity and PH of Mish during a Period of 14 Days of Storage (table 2 and figure 2). The acidity content, on the other hand, showed a reverse pattern, with a pH value that peaked at day 14 (4.92±0.026) and then dropped to the starting value of 3.68±0.026 (p0.01). After the first day, the pH dropped from 4.58±0.025 to 3.28±0.025 (p0.001). These findings are consistent with those of Boani and Tratnik (2001), who found that an increase in the number of lactic acid bacteria that transformed lactose into lactic acid was the primary cause of acidity near the end of the storage period. Table 3 showed the minerals of Mish from each plant over the storage period. Minerals (Ca++, Na+, K+, and P++) displayed an erratic pattern during the storage period, slightly decreasing towards the end in E and somewhat increasing in A. Table 3 and figure 3 depicts the minerals of Mish after 14 days of storage. The Ca++ concentration grew steadily from day one (2.49±0.021) to day 14 (0.81±0.021), after which it dropped (p0.001).

Factor A (Whey levels)	Acidity	PH
A (0%)	4.63[a]	4.20[a]
B (25%)	4.47[b]	4.10[b]
C (50%)	4.34[c]	3.93[c]
D (75%)	4.27[c]	3.63[d]
E (100%)	4.17[d]	3.47[e]
±S.E	0.033	0.033
Sig	**	**
Factor B (Storage Period)		
0ne day	3.68[c]	4.58[a]
Seven days	4.52[b]	3.74[b]
Fourteen days	4.92[a]	3.28[c]
±S.E	0.026	0.025
Sig	**	**
Factor A and Factor B		
±S.E	0.058	0.058
Sig	**	**

Table 2: Effect of whey levels and storage period on Acidity and PH of Mish.

a-e Mean within column with different superscript letter are significantly different at p<0.01. S.E Standard Error, Level of significance = ** : p<0.05

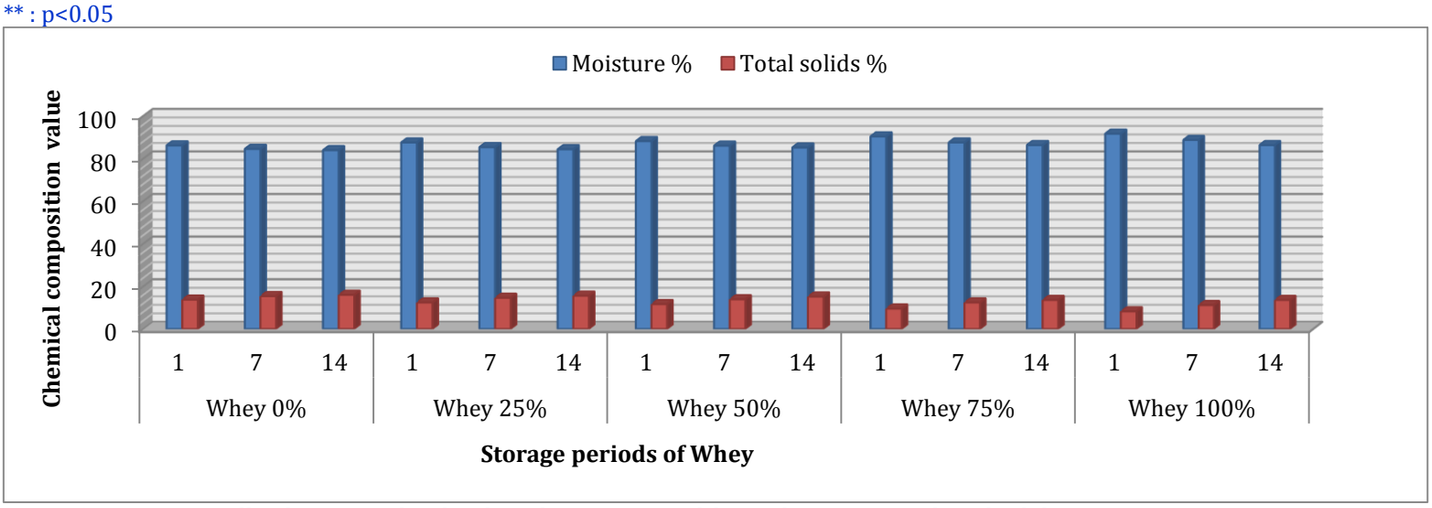

Figure 1: Interaction effect between whey levels and storage period for Mish moisture and total solids.

Factor A (Whey levels)	Ca ++	Na+	K+	P++
A (0%)	2.06[a]	1.15[a]	0.75[a]	0.13[a]
B (25%)	1.86[b]	1.09[a]	0.73[ab]	0.11[b]
C (50%)	1.69[c]	0.92[b]	0.71[b]	0.08[c]
D (75%)	1.56[d]	0.78[c]	0.70[b]	0.06[d]
E (100%)	1.43[e]	0.75[c]	0.70[b]	0.05[e]
±S.E	0.027	0.021	0.013	0.003
Sig	**	**	**	**
Factor B (Storage Period)				
0ne day	2.49[a]	1.42[a]	0.88[a]	0.14[a]
Seven days	1.87[b]	0.89[b]	0.77[b]	0.07[b]
Fourteen days	0.81[c]	0.51[c]	0.51[c]	0.04[c]
±S.E	0.021	0.016	0.010	0.002
Sig	**	**	**	**
Factor A and Factor B				
±S.E	0.047	0.037	0.022	0.004
Sig	**	**	**	**

Table 3: Effect of whey levels and storage period on minerals of Mish.

The Na+ concentration steadily declined to a minimum at day 14 (0.51±0.016), when the initial value (was 1.42±0.016) (p0.001). The K+ content followed, peaking at 0.88±0.010 on day one and then falling to (0.651±0.010) at the conclusion (p0.01). P++ content

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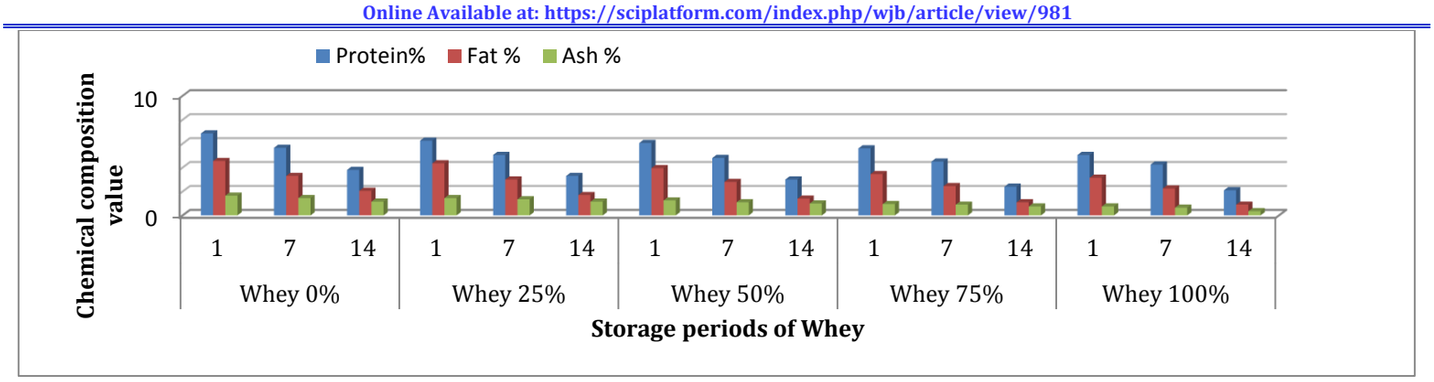

Figure 2. Interaction effect between whey levels and storage period for Mish protein, fat and ash.

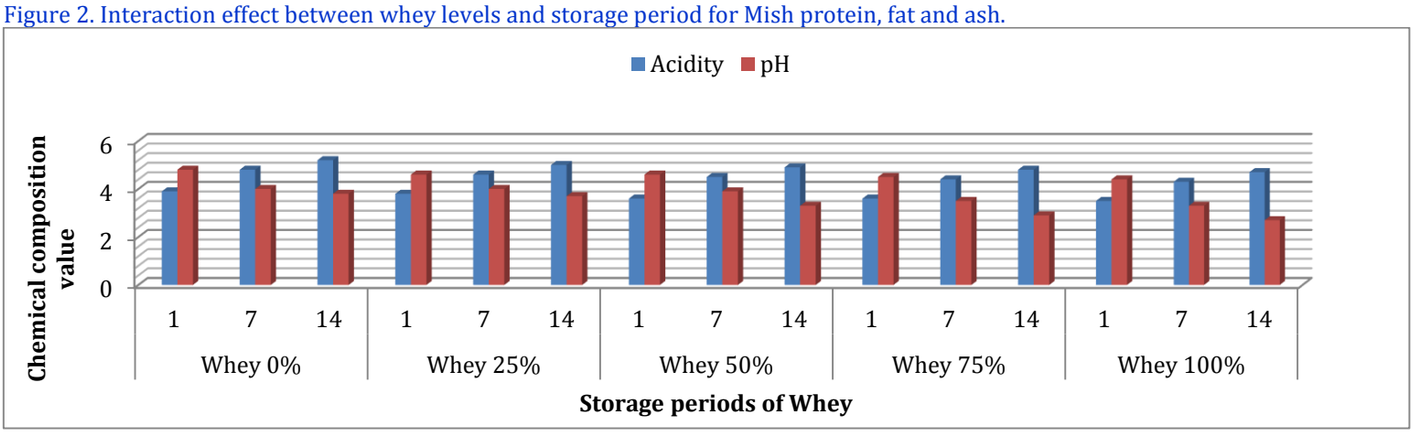

Figure 3. Interaction effect between whey levels and storage period for Mish acidity and pH.

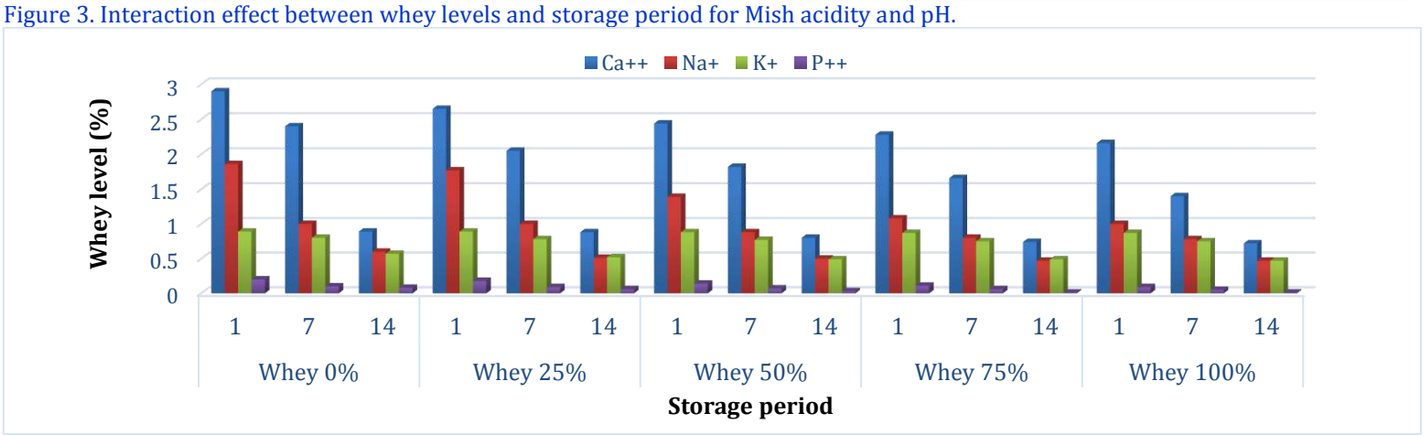

Figure 4: Interaction effect between whey levels and storage period for Mish minerals (Ca^{++},Na^{+}, K^{+} and P^{++}).

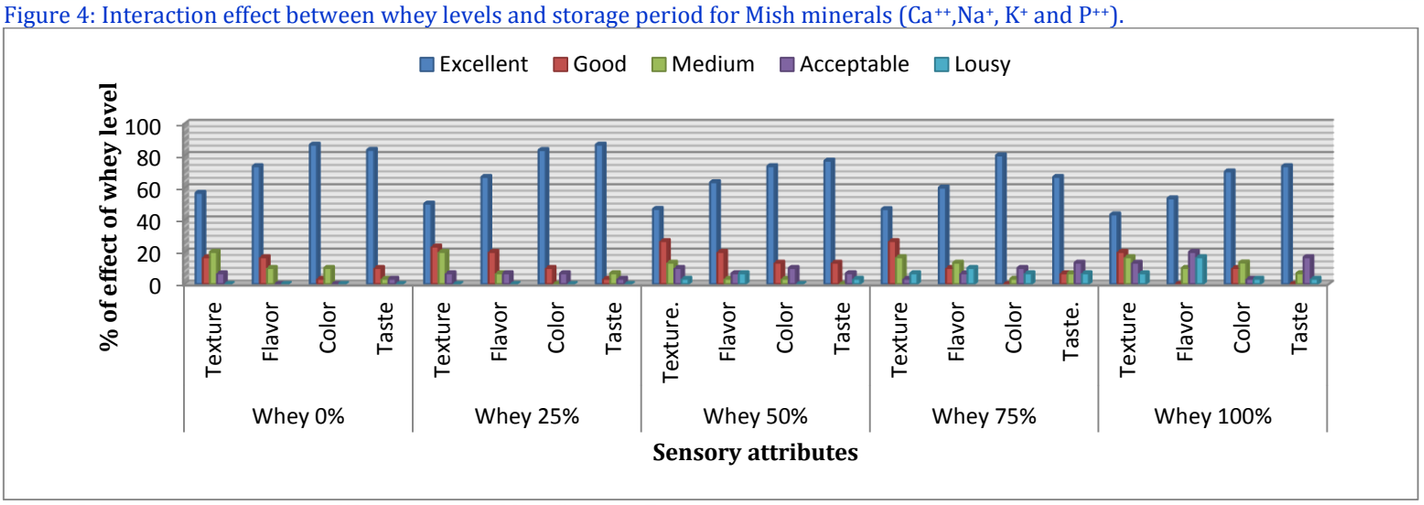

Figure 5. Percentage to effect of Whey levels on Mish Sensory Evaluation at day one.

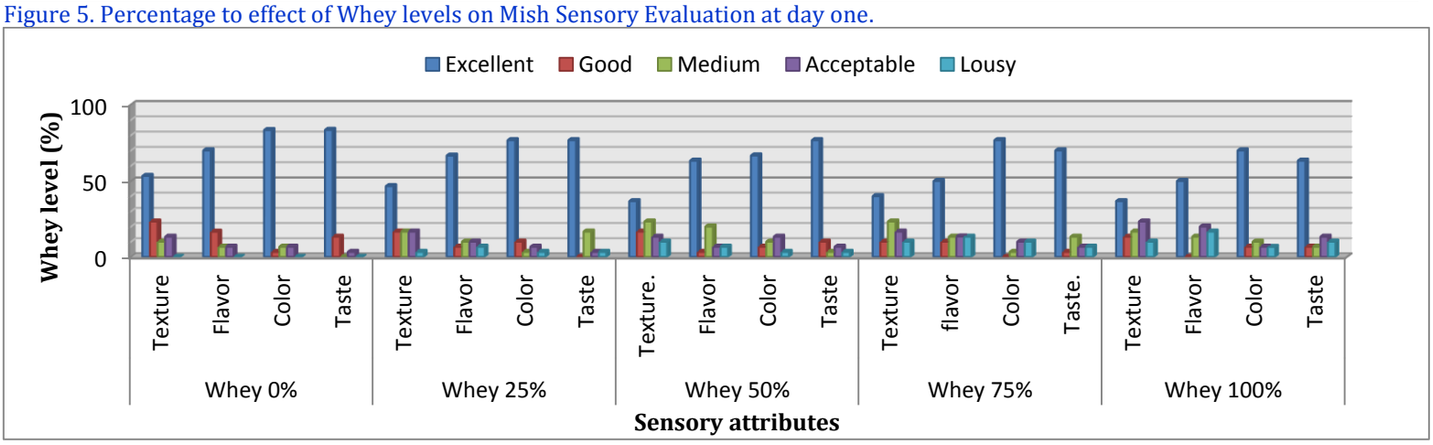

Figure 6: Percentage to effect of Whey levels on Mish Sensory Evaluation after 7 days.

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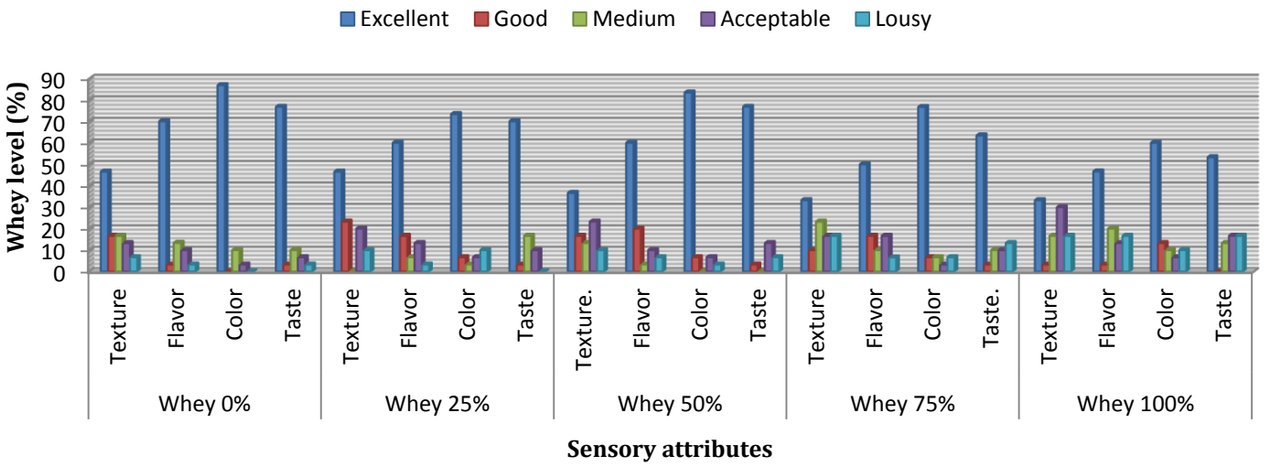

Figure 7: Percentage to effect of Whey levels on Mish Sensory Evaluation after 14 days.

The Whey-Mish samples (B, C, D, and E) after 14 days of the storage period had a low score of texture than fell from (0.04±0.002) on day 14 to (0.14±0.002) in the beginning (p0.001). Figure (5) showed differences in texture of different whey-Mish on day one. The results also indicated differences in the flavor, color, and taste of different types of Mish (A, B, C, D, and E). In contrast, all treatments had a high score (Excellent). Sensory characteristics of Mish samples decreased gradually during storage period, which confirmed by the results of other panelists that showed storage time had effect on Mish samples after 7 days (figure 6). The Whey-Mish samples (B, C, D, and E) after 14 days of the storage period had a low score of texture than the control Mish sample (A). Sensory c characteristics results were in a high score (Excellent) in the first treatment (A), then other treatments (B, C, D, and E) as described in figure 7.

CONCLUSION: The results of the chemical study showed that the pH of the samples of commercial and laboratory-produced mish was lower than that of the samples of fresh milk. In comparison to fresh milk samples, the total proteins (%), solid non-fat (%), fat (%), and protein (%) in commercial and lab-made mish samples were more impressive. The results of the microbiological tests showed that mish product is identical to ingestion. Panelists who favored the goat's laboratory made Mish over the cow's laboratory accepted all samples..

CONFLICT OF INTEREST: Authors have no conflict of interest.

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