International Journal of Scientific Research and Modern Technology (IJSRMT) ijsrmt.com
Volume 5, Issue 6, 2026
DOI: https://doi.org/10.38124/ijsrmt.v5i6.1483

The Effect of Mixing Soymilk with Cow's Milk and Storage Periods on Microbial Quality of Blended Cheese of Soymilk with Cow Milk in Different Proportions

Mustafa M. H.[1]; Bhagiel T. B.[2]; Iffat S. H.[3]

[1]Industrial Research &Consultancy Center (IRCC), Khartoum north, Sudan.
[2]Department of Animal Production, College of Agricultural Studies, Sudan University of Science and Technology, Sudan.
[3]Industrial Research &Consultancy Center (IRCC), Khartoum north, Sudan.

Publication Date: 2026/06/20

Abstract

This study was conducted to evaluate microbiological analysis of soft white cheese (Gibna–baida) of soymilk mixed with cow milk at different concentrations (100%, 75%, 50%, 25 %) and (0, 25%, 50%,75%) respectively, The microbiological analysis (TBC, yeast & Moulds and Coliform) were tested by using APHA standard as described by Neusely (2018), after that all soft cheese samples A(100 % soymilk);B;C;D) were determined. The microbiological analysis values of (TBC), showed a significant different at $P < 0.001$, Where it increased with the decreasing proportion of soy milk in A(100 % soymilk); B (75%soy milk* 25% cow milk) and D (25 soymilk* cow milk), which revealed (5.20 CFU/g, 544 CFU/g and 584 CFU/g,) respectively, while sample C recorded the lowest bacterial counts (5.14 CFU/g), whereas the yeast & Moulds shown Not significant different at $P < 0.05$ for all samples studied (A(100 % soymilk); B; C and D cheese, which presented (1.53, 1.58, 1.12 and 1.70 CFU/g) respectively, while Coliform counts obtained significant different at $P < 0.001$ which revealed (0.33 CFU/g , 0.91, 0.37 and 1.11 CFU/g) for A,B,C and D soft white cheese respectively. However the effect of storage periods on mixed soymilk with cow's milk soft white cheese in different ratios in (0 day, 15 days and 30 days) on TBC, Mold, yeast and Coliform counts averages shown as (5.29 CFU/g, 5.54 CFU/g and 5.39 CFU/g) of TBC respectively and (1.55 CFU/g, 1.46 CFU/g and 1.54 CFU/g) for yeast & Moulds, While coliform counts decreased significantly according to increasing of storage periods as revealed in (1.18 CFU/g, 0.8 CFU/g and 0.36 CFU/g) in 0 day , 15 days and 30 days respectively.

Keywords: *Soymilk, Cow's Milk, Soymilk Soft White Cheese, Mixed Milk Soft White Cheese, Microbiological Analysis, Storage Period.*

I. INTRODUCTION

Soybean (Glycine max) is a source of food for human, animal and raw material for manufacturing industries (Amogne etal,. 2023), where its recognized as source of high protein rich food in sub sahran Africa (Carina and Nicolette. 2021)

Consumption of soybean as foods substitute essentially to solve malnutrition and affecting around half of all the children in the developing countries)Khojely. etal. 2018). A high nutrition of soybean, which approximately contain 40% protein, 20% of mainly unsaturated fats, 17% fiber, and consider as good source of the minerals such as calcium (Ca),magnesium (Mg), potassium K), iron (Fe), and zinc (Zn), beside Its high protein is suitable and a proper source of children to reduce the incidence of disease as HIV/AIDS and tuberculosis Gandhi, (2009). Whereas, the most attractive reasons for the interest in soy foods is it's high quality protein among vegetarians (Kumar etal 2017).

M.H , M., T. B., B., & S. H. , I. (2026). The Effect of Mixing Soymilk with Cow's Milk and Storage Periods on Microbial Quality of Blended Cheese of Soymilk with Cow Milk in Different Proportions. *International Journal of Scientific Research and Modern Technology*, *5*(6), 121–126. https://doi.org/10.38124/ijsrmt.v5i6.1483

Soybean is a unique high protein and less carbohydrate content vegetable compared to other legumes Hoffman etal (2004).

The advantage of soybean among the other legumes is processed into many products for better palatability and nutritional aspects it is mainly processed into soy flour, soymilk, and other soymilk products rather than cooked and eaten like other beans Niyibituronsa etal; (2014) and Krishnan and Darly (2013).

There is a big variation of soy foods consumption in the developed countries. In Germany, Spain and Netherlands, most regularly consumed has been reported to be beans and leaves, where in Italy the most frequently consumed soy foods , were grain products, while in Denmark the most popular product is soy meat substitutes, whereas in the UK the main soy-based food consumed were soy meat substitutes Keinan etal (2002).Moreover soy products are well-known as a complete alternative for cow milk-based products, especially those are allergenic for lactose (Oh, Daliri, & Oh, 2018) and Rizzo & Baroni, (2018). Furthermore, soymilk provides disease's prevention of many diseases such cancer, osteoporosis, and the effects of aging (Ramdath etal., 2017) and Jiang etal., (2013) Additionally the soymilk is naturally cholesterol free, available, affordable, lactose-free, and its benefits for lactose-allergenic individuals (Suri etal., 2019).

The storage conditions is the main source of soymilk spoilage rather than the processing method used, however the shelf life increased by refrigeration storage Iwe and Agu (2003);Willcen(2007); Shi et al;(2015) and Lawrense and Drake (2016);Yan etal (2011)and Murugkar (2012).

Cheese is globally the most widespread milk product and offering a amount of necessary properties for consumers, particularly those who are intolerant proteins present in cow milk Rasika. and C.S.Ranadheera. (2020). Where its complexity and diversity depends on specific starters and adjunct cultures used (Montserrat and Bernard 2014)

Many factors affecting Cheese yield such as milk composition, amount and genetic variants of casein, milk quality, somatic cell count in milk, milk pasteurization, coagulant type, vat design, curd appearance and manufacturing parameters .Mona and Nawal (2011).

Due to the active biochemical and microbiological changes that happen in cheese manufacture, ripening, and marketing it consider as perishable commodity, therefore, the cheese sector trusts deeply on packaging Saeed. P, etal (2023).

According to low fat content of soymilk soft white cheese and blended (soymilk* cow,s milk) soft white cheese has acceptable harshness, this might be seen as having health benefits for consumers, where the consumers demand of the low fat cheeses more interested in the dietary and health benefits increased, especially in European countries Banks (2004).

The microbiological quality of white cheese affected with many factors such as milk quality, perfect pasteurization, manufacture techniques, in addition to microbiological growth during the manufacturing process, and finally the storage time Alper and Nesrin, (2013); Bintsis and Papademas, (2002).

Cheese quality and safety mainly affected by microorganism's growth during ripening and storage periods(Tilocca et al., 2020). As the development of microorganisms are mostly influenced by temperature, ripening procedures and storage period (Leclercq-Perlat et al., 2015).

II. MATERIAL AND METHODS

➢ *Materials*

Soy bean Soybean (Glycine max) seeds were collected from Agricultural Research Corporation (ARC), Wad medni, raw cow milk collected from, Khartoum North farm. Sodium Chloride and lemon acquired from local market, necessary chemicals for analytical grades obtained from Laboratory of Dairy and Food Research.

- *Soymilk Extraction:*

Soymilk was extracted using modified method as by Belewu and Belewu (2007).as follows:-

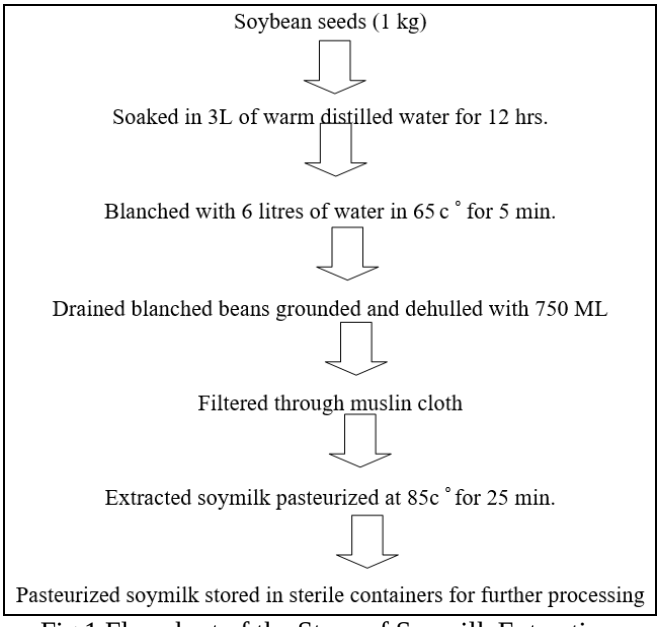


Fig 1 Flowchart of the Steps of Soymilk Extraction

- *Cheese Manufacturing:*

The production of the blended soymilk * cow milk soft white cheese using modified method as described by Igyor et al. (2006), the soft cheeses were made by substituted partially formulated soymilk of cow milk . Varying proportions were 0:100; 75:25; 50:50 and 25:75% cow: soymilk (v/v). Extracted lime juice was added (10%) into each of the formulated blends and the control sample. Each combination mixed carefully, heated slowly and moved until a temperature of 70oC.

After 20 minutes of heating, whey drained, salted 5% NaCl, then curd from each blends Sliced in small cubes using stainless knife.

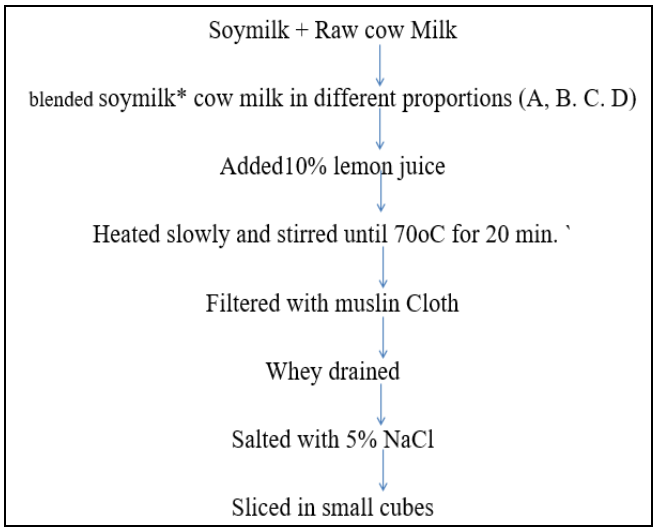


Fig 2 Flowchart of Production of (Soymilk*Cow's Milk) Soft White Cheese

- *Microbiological Analysis:*

Cheese samples were withdrawn from each treatment, kept in sterile containers and transferred immediately to the microbiology laboratory, the microbial parameters studied using APHA standard as described by Neusely (2018).

➢ *Statistical Analysis*

Data of microbial analysis transformed into log cfu/g for all parameters, analysed as a 2 * 4 * 3 factorial design using (SPSS, version 21). Means of main effects by Duncan test, while means of significant interaction were separated.

III. RESULTS AND DISCUSSION

Table 1 Microbiological Analysis (TBC, Yeast & Moulds and Coliform) of Soft White Cheeses Made from Different Proportions of Soya Bean and Cow's Milk.

Treatment	Parameter (CFU/g)		
	Total Bacteria Count	yeast & Moulds	Coliform
A	**5.20^{c}**	1.53	**0.33^{b}**
B	**5.44^{b}**	1.58	**0.91^{a}**
C	**5.14^{c}**	1.12	**0.37^{b}**
D	**5.84^{a}**	1.70	**1.11^{a}**
SEM	**0.06**	0.04	**0.07**
Significance	***	NS	***

A = 100 % Soymilk; B = 75 % Soymilk; C = 50 % Soymilk; D = 25 % Soymilk. *** = Significant.

Table 1 shows the microbial attributes of soft white soy cheese. (TBC) ranged between 5.14 and 5.84 , Soft white cheese made with 50%/50% soy milk* cow milk had less bacterial count followed by A (100% soy milk). Higher TBC was detected when bovine milk substituted with 75% soy milk. These findings were in disagreement with Zakaria A etal (2012), whom declared the existence of pathogenic bacteria like coliform in tested cheese, which contaminated with (TBC) and yeasts & moulds, which averaged 9.02x 106 of TBC, 5.5x101 of coliform and 1.86x105 of yeast & moulds. Total Bacterial Count in the present study revealed a similar to the to that reported by Jaber (2011) who declared that the camel cheese different during the storage time, and lower than that reported by (Block and Herman,(2002. Other microorganisms such as yeast & Moulds detected lower count in C cheese. Higher yeast & moulds count were identified when 25% of soy milk used. These results are relatively close to the mentioned by Beresford et al. (2001).

However these results were not agree with that stated by Elowni and Hamid (2007), whom mentioned that the yeast & Moulds count in white cheese collected from Zalingi area, was 4.46 cfu/ml. Moreover, the results gained from this study are less than that described by Girgis et al., (1992) for ras cheese from Egyption market, whom they reported 0.15x104 and 8x105. Moreover, final results obtained from this study was not in line with that presented by Jemima (2018) who stated cell concentrations of yeast in soy-cheese with 10.14. Soft white cheese made with pure soymilk (100% soy milk) had better quality of coliform count followed by that made of 50%/50% . More coliform count was identified when cow milk substituted with 75%/ of soy milk.

The results of Total Bacterial Counts (TBC) and Coliform count showed in Figure 2 presented significant different ($P<0.05$) during the (0, 15 and 30) days of storage period, which revealed (5.29, 5.54 and 5.39) and 1.18, 0.8 and 0.36) of TBC and coliform for 0, 15 and 30 days of storing soft white cheese of mixed soymilk *cow's milk in different proportions respectively. While yeast & Moulds revealed (1.55 CFU/g for fresh soft white mixed (soymilk*cow's milk) cheese, 1.46 CFU/g and 1.54 CFU/g) for 15 days and 30 days of storage period respectively. Where the TBC developed after 15 days and reduced after 30 days of storage period, white the yeast & Moulds counts reduced after 15 days and starting developed after 30 days of storage period. These results

were agreed partially with that stated by Ahmed (1985) and allagabo (1986) whom stated that all microbial groups, including yeast & Moulds and bacterial count increased .during storage of white cheese, nevertheless the obtained results in disagreement with that found by Mohamed. and Husna (2017), whom found higher counts of Yeasts & moulds in cheese after pressing step.

Whereas the effect of storage periods on mixed soymilk with cow's milk soft white cheese in different ratios of coliform counts decreased significantly during storage periods, which was not in accordance with Nazim etal (2013) reported that the Total coliform was absent in first two month of storage period after cheese manufactured. Low coliform counts were probably due to the high salt concentration and heat treatment effect Olerta et al.(1999) and Turkoglu et al., 2003).

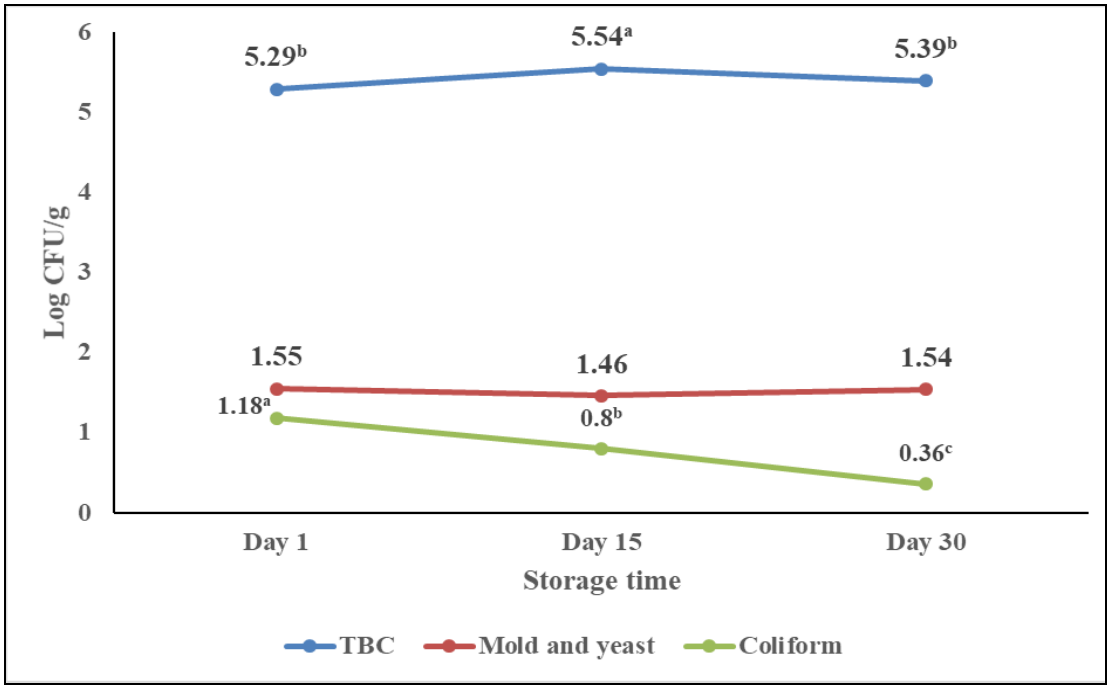


Fig 3 Effect of Storage Time on Microbial Analysis of White Cheeses Made from Different Proportions of Soya Bean and Cow's Milk.

IV. CONCLUSION

The present study concluded that (TBC) of blended soymilk/ cow's milk in different proportions was significantly different during the storage period. While, yeast & Moulds count were not significantly different, whereas Coliform reduced during storage time, moreover, the findings of soft white cheese of equally proportions soymilk* cow's milk C cheese = (50% /50%) has a better microbial quality compared with those of soymilk*cow's milk in different proportions.

Future studies should focus on using different percentages of soymilk to substitute cow's milk in soft white cheese for procuring more varieties of cheese from different proportions of soymilk. This will augment our understanding about even more types of blended soymilk/ cow's milk soft white cheese and their properties.

REFERENCES

[1]. Ahmed, A.M (1985) .Bacteriogical and hemical characteristics of Sudanese white cheese produced and stored under different conditions. Ph. D. thesis , university of Khartoum, sudan .

[2]. Ahram Oh, Eric Banan-Mwine Daliri, Deog H Oh (2018). Screening for potential probiotic bacteria from Korean fermented soybean paste: In vitro and Caenorhabditis elegans model testing. : LWT - Food Science and Technology, Vol. 88, 132-138 ref. 44. Department of Food Science and Biotechnology, College of Agriculture and Life Science, Kangwon National University, Hyoja 2 dong, Chuncheon 200-701, Korea Republic

[3]. Allagabo L.H . (1986) studies on the compstion and quality of Gibna Beyda .M .Sc thesis , University of Khartoum , sudan .

[4]. Alper, S., and Nesrin, C. (2013). Bacterial contamination in fresh white cheeses sold in bazaars Canakkale, Turkey. International Food Research Journal, 20(3), 1469–1472.

[5]. Amogne A, Malede M, Hunde D, Tefera G, Tefera E, Arega A.(2023). Performance of Andinet soybean (Glycine max (L.) Merrill) Variety. Ethiop J Agricultural Sci.:19–28.

[6]. Banks, J.M. (2004).The technology of low-fat cheese manufacture. International Journal of Dairy Technology Volume 57, Issue 4 pp. 199-207.

[7]. Belewu, M. A. and Belewu, K. Y. (2007). Comparative Physio-Evaluation of Tiger-nut, Soybean and Coconut Milk Sources. Int. J. Agric. Biol. 9:785 – 787.

[8]. Beresford TP, Fitzsimons NA, Brennan NL, Cogan TM (2001). Recent advances in cheese microbiology. International Dairy Journal 11:259–274.

[9]. Bintsis, T and Papademas, P. (2002). Microbiological quality of white-brined cheeses: A review. International Journal of Dairy Technology, 55(3), 113–120. 10.1046/j.1471-0307.00054.
[10]. Carina H and Nicolette G.(2012). Dietary protein quality and malnutrition in Africa. Br J Nutr. 69–76.
[11]. De Block, L. Herman (2002). Hygienic parameters, toxins pathogens occurrence in raw milk cheeses. J. Food Safety, 2002, 22 (3), 183-196.
[12]. Elowni, O. A. O. and Hamid, O. I . A. (2007). Production of white cheese (Gibna beyda) in Zalingei Area West Darfgur (Sudan). Australian J. of Basic and Applied science, 1 (4) 756 – 761.
[13]. Gandhi, A. P. (2009). Review paper quality of soybean and its food products.International Food Research Journal, 16, 11–19.
[14]. Gianluca Rizzo, and Luciana Baroni (2018). Soy, Soy Foods and Their Role in Vegetarian Diets. Journals Nutrients Volume 10 Issue 1 10.3390/nu10010043 . Primary Care Unit, Northern District, Local Health Unit 2, 31100 Treviso, Italy. Via Venezuela 66, 98121 Messina, Italy.
[15]. Girgis, E. S., M. N. A. Hassan, and L. M. youssef (1992). Some chemical and microbiological properties of Ras cheese in the Egyptian market. Egyptian J. Dairy sei. 20: 373 – 387.
[16]. Hoffman, J.R. and Falvo,M.J.(2004).Which is Best Protein? Journal of sports sciences. Med., 3, 118–130.
[17]. Igyor, M. A., Igbian, E. K. and Iorbo, C. I. (2006). Effects of Soymilk Supplement on the Yield and Quality of 'Warankashinkashi'. Nigerian Food Journal, 24(1):92 – 97. 19.
[18]. Iwe, M.O.andAgu,I.F. (2003). Use of Natural flavour rants to improve soymilk acceptability, Nigeria education J.11;16---24.
[19]. Jaber, N.N.(2011) Isolation and biotyping of Staphylococcus aureus from white cheese in Basrah local markets. Bas. J. Vet. Res., 10 (2), 55-66.
[20]. Jemima (2018). Safety assessment and microbiological quality of homemade soy-cheese in Nigeria. Journal of Food SafetyVolume 38, Issue 5.
[21]. Jiang S, Cai W and Xu B. (2013). Food quality improvement of soymilk made from short-time germinated soybeans. Foods.;2:198–212.
[22]. Keinan-Boker, L.; Peeters, P.H.M.; Mulligan, A.A.; Navarro, C.; Slimani, N.; Mattisson, I.; Lundin, E.; McTaggart, A.; Allen, N.E.; Overvad, K (2002). Soy product consumption in 10 European countries: The European Prospective Investigation into Cancer and Nutrition (EPIC) study. Public Health Nutr. 5, 1217–1226.
[23]. Khojely DM, Ibrahim SE, Sapey E, Han T, Mohamedkheir D, Elrayah S.(2018). History, current status, and prospects of soybean production and research in sub-Saharan Africa. Crop J. 26–35. :doi.org/10.1016/j.cj.2018.03.006.
[24]. Kumar, P.; Chatli, M.K.; Mehta, N.; Singh, P.; Malav, O.P.; Verma, A.K.(2017). Meat analogues: Health promising sustainable meat substitutes. Crit. Rev. Food Sci. Nutr. 57, 923–932.
[25]. Lawrense, S. E, and Drake,M.A. (2016). Preference mapping of soymilk with different Consumers, Journal of Food Science 76:81.
[26]. Leclercq-Perlat, M.N., Sicard, M., Perrot, N., Trelea, I.C., Picque, D. and Corrieu, G. (2015). Temperature and relative humidity influence the ripening descriptors of Camembert-type cheeses throughout ripening. Journal of Dairy Science, 98(2), 1325-1335.
[27]. Mohamed O.M. and Husna E. A (2017). Microbiological Characteristics of White Cheese (Gibna bayda) Manufactured under Traditional Conditions, Journal of Advances in Microbiology 2(3): 1-7, Article no.JAMB.33152.
[28]. Mona AM Abd El-Gawad,and Nawal S Ahmed(2011). Cheese yield as affected by some parameter , Acta Scientiarum Polonorum Technologia Alimentaria 10 (2), 131-153.
[29]. Montserrat. A, Bernard. M (2014).Cheese classification, characterization, and categorization: a global perspectiveCheese and microbes, 39-71.
[30]. Murugkar, D.A. (2012).Chemical composition and quality of soymilk, Journal of Food Science and technology 51:615-621.
[31]. Nazim, M. U., Mitra, K., Rahman, M. M., Abdullah, A. T. M. and Parveen, S. (2013). Evaluation of the nutritional quality and microbiological analysis of newly developed soya-cheese. International Food Research Journal 20(6): 3373-3380
[32]. Neusely Da Silva, Marta H Taniwaki, Valéria CA Junqueira, Neliane Silveira, Margarete Midori Okazaki and Renato Abeilar Romeiro Gomes (2018). Microbiological examination methods of food and water:
[33]. Olerta CS, Sanz E, Gonzalez F, Torre P (1999). Microbiological and physicochemical characteristics of Cameros cheese. Food Microbiol. 16:615-621.
[34]. Ramdath DD, Padhi EMT, Sarfaraz S, Renwick S, Duncan A.(2017). Beyond the cholesterol lowering effect of soy protein: A review of the effects of dietary soy and its constituents on risk factors for cardiovascular disease. Nutrients.;9(1):324.
[35]. Rasika.D, and Ranadheera.C, (2020). Probiotic and Prebiotics in Foods: Challenges, Innovations and Advances, Advances in Food and Nutrition Research.
[36]. Saeed P, Hamed A, Antonella P, Amir. A. A, Sara. Y. B and Sima M (2023). Bio-nanocomposites and their potential applications in physiochemical properties of cheese, Journal of Food Measurement and Characterization 17 (3), 2595-2606,
[37]. Shi, X., li, J. and Wangs,Z. L. (2015).Flavour characteristic analysis of soymilk, Journal of Food chemistry (9).422.
[38]. Suri S, Kumar V, Prasad R, Tanwar B, Goyal A, Kaur S. (2019). Considerations for development of

lactose-free food. J Nutr Intermediary Metabolism.;15:27–34.
[39]. Tilocca, B., Costanzo, N., Morittu, V.M., Spina, A.A., Soggiu, A., Britti, D., Roncada, P. and Piras, C. (2020). Milk microbiota: Characterization methods and role in cheese production. Journal of Proteomics, 210, 103534.
[40]. Turkoglu H, Ceylan ZG, Dayisoylu KS (2003). The microbiological and chemical quality of Orgu cheese produced in Turkey. Pak. J.Nut. 2(2):92-94.
[41]. Willcen, W. F. (2007).Effect at processing on oxidative off flavour of soymilk. Journal of Food Techno; 21:1630-1633.
[42]. Zakaria A. S., Abdel Moneim E. S. , Elamin A. E. and Ali O A.(2012). Chemical and Microbiological Characteristics of White Cheese (Gibna-baida) Produced in Sudan, Food and Public Health, 2(6): 259-264 DOI: 10.5923 /j.fph. 0206.11.