



SENSORY ANALYSIS OF THERMAL AND NON-THERMAL PROCESSED MILK SAMPLES

R. Manickavasagam¹, M. Seethalakshmi² and S.Meenakshi³

¹Research Scholar, School of Agriculture and Animal Science, Gandhigram Rural Institute – Deemed University, Gandhigram. Tamil Nadu, India

²Professor & Head, School of Agriculture and Animal Science, Gandhigram Rural Institute – Deemed University, Gandhigram. Tamil Nadu, India

³Professor, School of Science, Department of Chemistry, Gandhigram Rural Institute – Deemed University, Gandhigram. Tamil Nadu, India

ARTICLE INFO

Article History:

Received 13th January, 2020

Received in revised form 11th

February, 2020

Accepted 8th March, 2020

Published online 28th April, 2020

Key words:

Sensory Analysis, Pasteurized, Microfiltered and UV Treated milk

ABSTRACT

Pasteurization of milk is done by heating the milk to 71.7°C for 15 seconds to destroy harmful bacteria and reduce the numbers of spoilage organisms to extend shelf-life and it doesn't kill thermophilic bacteria. The non thermal processing milk such as microfiltration and UV radiation of milk are serving as an alternative methods for processing milk. The treatments were divided as pasteurized milk (TC - control), rawmilk (T1), microfilteredmilk (T2), UV treated milk at 1.5 kj and UV treated milk at 1.7 kj respectively. The storage of various milk samples at 4-5°C up to 12 days revealed that the UV processed milk at 1.5kj obtained a moderately high score by the sensory analysis on 9 point hedonic scale and the sensory panel commented as like slightly (6) and up to 9 days of storage the sensory panel commented as like moderately (7). The treatments pasteurized milk, microfiltered milk and UV treated milk at 1.7 kj samples obtained low sensory scores (less than 5 on the 9 point hedonic scale) till storage up to 12 days. Finally, the UV treatment of milk at 1.5kj can be an alternative to thermal processing of milk due to higher preference by the sensory panel.

Copyright©2020 R. Manickavasagam, M. Seethalakshmi and S.Meenakshi. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited

INTRODUCTION

The pasteurization of milk is done by heating the milk to 71.7°C for 15 seconds to destroy pathogenic bacteria and decrease the numbers of spoilage organisms and to extend the shelf-life. Pasteurization process doesn't kill thermophilic bacteria and heat stable enzymes. Moreover, during pasteurization process loss nutrients will occur due to heat treatment of milk. Presently, non thermal processing technologies such as membrane filtration technique such as microfiltration and ultra violet radiation treatment of milk become popular as an alternative methods for processing milk. Microfiltration uses pore size diameters of 0.1–2.0 µm and allowing the retention of milk particles, such as somatic cells, fat globules, bacteria and casein micelles (Coimbra and Teixeira, 2010). The UV light acts as a physical method for microbial disinfection and does not generate any heat and chemical residues. Further, UV treatment of milk has low maintenance cost, low installation cost and low operational cost with minimal energy use. In spite of its many advantages, its low penetration power restricts the area of use in food industry (Ayhan and Halil, 2016).

Hence, the study has been designed to analyze the sensory properties of pasteurized milk as control and raw milk, microfiltered milk, UV treated milk at 1.5 kj and UV treated milk at 1.7 kj by adopting the 9 point hedonic scale with a experienced sensory panel for consumer acceptance.

MATERIALS AND METHODS

The raw milk collected from the farmers in and around Dindigul by the M/s Dindigul Farm Products Pvt Limited, Dindigul, Tamil Nadu, India was utilized in this study. The pasteurized milk was obtained from the M/s Dindigul Farm Products Pvt Limited, Dindigul, Tamil Nadu was utilized in this study. HTST pasteurization equipment manufactured and supplied by M/s Tavaron Engineers, the model no: N-35, 930/171/2013 was utilized by following manufacturer's instruction. The microfiltration of milk was carried out at the M/s Dindigul Farm Products Pvt Limited, Dindigul, Tamil Nadu, India was utilized in this study. The microfiltration unit supplied by M/s Pall Corporation, Newyork, USA was utilized in this study. The commercial Surepure 40 Turbulator TM system (SP-40) designed and manufactured by Surepure AG, Switzerland installed at M/s L.P Dairy, Kanchipuram, Kalavai, Tamil Nadu, India was utilized in this study. The required raw milk for UV treatment was obtained from M/s L.P Dairy,

***Corresponding author: R. Manickavasagam**

Research Scholar, School of Agriculture and Animal Science, Gandhigram Rural Institute – Deemed University, Gandhigram. Tamil Nadu, India

Kanchipuram, Kalavai, Tamil Nadu. The milk samples has been processed 1.5 and 1.7 kj respectively.

The treatments were divided as pasteurized milk (TC - control), rawmilk (T1), Microfiltered milk (T2), UV treated milk at 1.5 kj and UV treated milk at 1.7 kj respectively. The milk samples were subject to sensory analysis on 0, 3, 6, 9, 12 and 14 days of storage at 4-5°C. The nine point hedonic score card (Table 1) used by Sonaliet al. (2016) was utilized in the study to evaluate sensory evaluation of the various milk samples. Ten experienced persons between the ages of 35- 45 (5 females and 5 males) at experiment test area were recruited to take part in consumer sensory panel. Consumer acceptance of the experimental products was evaluated accordingly. The results of sensory analysis of various parameters of milk samples were subjected to analysis of variance (ANOVA) procedure. The data were analyzed by approved statistical methods of Snedecor and Cochran (1989).

Table 1 Nine point hedonic scale

Score	Consumer acceptance
1	Dislike extremely
2	Dislike very much
3	Dislike Moderately
4	Dislike Slightly
5	Neither like nor dislike
6	Like slightly
7	Like moderately
8	Like very much
9	Like Extremely

Sensory evaluation of control and various treatments samples were carried out using 9-point hedonic scale. Ten panelists were selected based on their previous experience and knowledge on sensory evaluation of dairy and dairy-associated products. All milk samples were taken out from the refrigerator and the samples were served at room temperature. Each milk sample was presented in a 100 ml pet bottles filled with 50 ml milk sample fitted with lid and labeled with a 3-digit code. Order of presentation of samples was randomized. Each panelist was provided with water and expectoration cups to rinse their mouths between samples.

RESULT AND DISCUSSION

The results of the sensory evaluation scores (Table 2) of the respective samples from 0 to 12 days of storage exhibited a significant difference (P < 0.01) between control (pasteurized milk) and treatments (raw milk, microfiltered milk, UV treated milk at 1.5 kj, and UV treated milk at 1.7 kj) respectively. Obviously, the observations pertaining to sensory evaluation of the various milk samples revealed that the UV treated 1.5 kj milk sample (T3) obtained an average sensory score of 6 (Like slightly) in the 9 point hedonic scale evaluated by the sensory panel on day 12. Up to 6 days of storage except raw milk, all the milk samples were preferred by the sensory judges with slight variation. But on day 9 and 12 days, the UV treated milk at 1.5 kj (T3) has higher preference by the sensory panel. Including control and other treatments were rejected by the sensory panel on day 14 due to spoilage.

Table 2 Sensory evaluation of milk samples (n=10) stored at 4-5°C

Days of storage at 4-5°C	TC	T1	T2	T3	T4
0	9.00 ^a ±0.00	6.80 ^c ±0.13	8.60 ^a ±0.16	8.70 ^a ±0.15	7.70 ^b ±0.15

3	8.50 ^a ±0.50	5.90 ^c ±0.18	7.60 ^a ±0.22	8.50 ^a ±0.22	7.10 ^b ±0.10
6	7.00 ^b ±0.13	4.40 ^c ±0.16	6.30 ^b ±0.15	7.60 ^a ±0.16	6.50 ^b ±0.11
9	5.40 ^c ±0.12	3.30 ^d ±0.13	5.30 ^c ±0.11	7.00 ^a ±0.20	6.00 ^b ±0.13
12	4.80 ^b ±0.11	1.60 ^d ±0.16	4.20 ^b ±0.13	6.00 ^a ±0.21	3.10 ^c ±0.23

Means bearing different superscripts differ significantly (P<0.01)

Anjum et al., (2019) reported that the sensory evaluation on the overall acceptability of pasteurized milk stored at 4°C on day 12 was 8.33 on 9 point hedonic scale. Petrus et al., (2010) studied the keeping quality of homogenized whole pasteurized (75°C/15 s) milk packed in HDPE bottle and LDPE pouches stored at 4°C for 28 days and the samples had the overall acceptability score on 7 point hedonic scale for HDPE bottle was 5.0 and LDPE pouch was 5.7 respectively. Anna et al., (2015) studied the sensory quality of market milk samples using 5 point hedonic scale and found that significantly lower intensity of the milk odour was indicated for the milk products which were preserved by microfiltration and pasteurization method, while higher intensity was found for milk preserved using high temperature pasteurization. Rafael et al., (2016) reported that the microfiltration at 50°C is equivalent to LTLT pasteurization, in terms of reducing microbial counts, and can extend the shelf life by 15 to 20 days when compared with pasteurized milk. Brans et al., (2004) reported that incorporation of microfiltration in the milk manufacturing process can improve the microbial and sensory quality of milk. Reinemann et al., (2006) reported that milk exposed to UV at a dose of 0.47 J/l was preferred at 1 and 14 days over HTST, with slight preference to HTST on days 7 and 21. The most common off-flavor noted in UV plus pasteurized milk at the 1.4 kJ/l dose was unclean flavor. Matak et al., (2007) found that the odor of fresh, raw goat milk (control) was different (P<0.05) from goat milk that had been exposed to UV light (12 pass UV) but not different from milk that was passed through the processor 12 times without being exposed to UV (12 pass no UV). In the present study storage of various milk samples at 4-5°C up to 12 days revealed that the T3 (UV treated milk at 1.5kj) obtained a higher score by the sensory analysis, followed by TC, T2 and T4 respectively. The T3 (UV treated milk at 1.5 kj) has been preferred much by the sensory panelists compared to other treatments. The raw milk (T1) has been rejected by the sensory panel. The present results are closer to the values as reported by Anjum et al., (2019), Petrus et al., (2010), Anna et al., (2015), Rafael et al., (2016), Brans et al., (2004), Reinemann et al., (2006) and Matak et al., (2007) respectively.

CONCLUSION

Conclusion can be made that the storage of various milk samples at 4-5°C up to 12 days revealed that the UV treated milk processed at 1.5kj obtained a moderately high score by the sensory analysis on 9 point hedonic scale and the sensory panel commented as like slightly (6) and up to 9 days of storage the sensory panel commented as like moderately (7). The treatments pasteurized milk, microfiltered milk and UV treated milk at 1.7 kj samples obtained low sensory scores (less than 5 on the 9 point hedonic scale) till storage up to 12 days. In practical, the UV treatment of milk at 1.5kj can be alternative to thermal processing of milk due to higher preference by the sensory panel.

References

- Anjum R, Imran J, Barbara R, Shyam S, Muhammad A, Muhammad AA, Muhammad A., Muhammad, I., Tanweer, A. G., Muhammad I.A, Muhammad A, Bahare S, Célia FR., Javad S and Natália M (2019). Measurement of off-flavoring volatile compounds and microbial load as a probable marker for keeping quality of pasteurized milk. *Appl. Sci.*, 9: 2-16.
- Anna P, Franciszek S, Eliza K, Małgorzata Ż and Anna S (2015). Microbiological and sensory quality of milk on the domestic market. *Pol. J. Food Nut. Sci.*, 65(4): 261–267.
- Ayhan D and Halil IK (2016). Ultraviolet radiation (UV) applications in milk industry. *Int. conference on Eng. and Nat. Sci.*, 10: 2757 - 2760.
- Brans G, Schroën CGPH, Van der Sman, RGM and Boom RM (2004). Membrane fractionation of milk: state of the art and challenges. *J. Memb. Sci.*, 243(1-2): 263-272.
- Coimbra JSR and Teixeira JA (2010). (Ed.). Engineering aspects of milk and dairy products. Boca Raton: Taylor and Francis Group, P. 673.
- Matak, K. E., Sumner, S. S., Duncan, S. E., Hovingh, E., Worobo, R. W., Hackney, C. R. and Pierson, M. D. 2007. Effects of ultraviolet irradiation on chemical and sensory properties of goat milk. *J Dairy Sci.*, 90:3178–3186.
- Petrus RR, Loiola CG and Oliveira CA (2010). Microbiological shelf life of pasteurized in bottle and pouch. *J Food Sci.*, 75(1): 36-40.
- Rafael F, Marisa MM, Ana ANP and Ana PPB (2016). Sanitary aspects and technological challenges of whole milk microfiltration at low temperatures. *Pesq. Agropec. Bras. Brasília*, 51(8): 990-997.
- Reinemann DJ, Gouws P, Cilliers T, Houck K and Bishop JR (2006). New methods for UV treatment of milk for improved food safety and product quality. Presented at the 2006 ASABE Annual International Meeting, Portland, Oregon, USA.
- Snedecor GW and Cochran WG (1989). Statistical methods. 9th Edn. The Iowa State University Press, Ames, Iowa.
- Sonali LP, Balakrishnan S and Aparnathi KD (2016). Sensory attributes and physicochemical characteristics of cultured buttermilk prepared by partial substitution of milk with paneer whey. *Int. Curr. Microbiol. App. Sci.*, 5(12): 333-348.

How to cite this article:

R. Manickavasagam, M. Seethalakshmi and S.Meenakshi (2020) 'Sensory Analysis of Thermal and Non-Thermal Processed Milk Samples', *International Journal of Current Advanced Research*, 09(04), pp. 21780-21782.
DOI: <http://dx.doi.org/10.24327/ijcar.2020.21782.4289>
