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Evaluation of Quality Attributes of *litchi* (*Litchi chinensis* Sonn.) flavoured Honey Yoghurt during Storage

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ABSTRACT: Yoghurt is one of the widely popular dairy products. Various sweetening agents are used for enhancing their perceptibility. The inclusion of honey in yoghurt not only provides the desired sensorial attributes but further promotes probiotic growth and functional characteristics. *Litchi* could be utilized for further enhancement of desired attributes such as natural flavour, colour, and other nutritional, pharmacological, and techno-functional characteristics. The major challenge was to see, effect of addition of lithi fruit with honey as sweetener. In this study fresh litchi pulp at @ 2, 4, and 6% was used. The formulated *litchi*-flavoured stirred honey yoghurt was examined for several physicochemical parameters such as pH, acidity, syneresis, and tyrosine value during refrigerated storage at an interval of 5 days for 20 days. Our investigation revealed a substantial ($p<0.05$) reduction in pH and an increase in acidity, syneresis, and tyrosine value among different treatments during storage. Plain (natural) and *litchi*-flavoured stirred honey yoghurt were also reported to be considerably different. The outcomes of study is there is significant increased syneresis and degree of proteolysis as a result that the product could be kept well up to 15 days of refrigerated storage.

Keywords: Litchi, yoghurt, tyrosine value, acidity, syneresis.

INTRODUCTION

Milk and milk products are cherished by consumers and the total milk production share corresponds to 20.17 percent (Arora, 2019). Among various milk products, yoghurt is one of the most popular fermented dairy products consumed worldwide, which has great consumer acceptability due to its health benefits other than its basic nutrition. It is traditionally made from the spontaneous or induced lactic acid fermentation of milk (Weerathilake *et al*., 2014; Arora *et al*., 2021). Standard yoghurt is typically manufactured from the conventional starter culture strains, *Lb. delbrueckii* ssp. *bulgaricus* and *S. thermophilus* (Fazilah *et al*., 2018). Yoghurt is easier to digest than milk (even for those who are lactose intolerant), as the fermentation process partially hydrolyzes the different components of milk, including protein, fat, and lactose (Savaiano, 2014). Yoghurt's physico-chemical qualities, perceptiveness, and textural features are crucial for its marketability in addition to its nutritional value and health advantages brought on by live microbes (EFSA, 2010).

Plain dairy products have a sour taste and are therefore not preferred by some consumers. Their flavours may need to be improved with sweeteners (Sert *et al*., 2011). Additionally, a variety of food ingredients are being used for milk supplementation to improve its nutritional qualities and technological capabilities, such as milk protein (Peng *et al*., 2009) and whey protein (Sharanagouda *et al*., 2019). Yoghurt can have various sweeteners added. Today, sugar is used to sweeten the majority of yoghurt (Aryana and Olson 2017). Researchers sometimes experiment with various sweeteners. Yoghurts were sweetened by adding sugar, high fructose corn syrup, and various kinds of honey (Popa and Ustunol, 2011). Pine honey's impact on probiotic yoghurt's quality characteristics has been researched (Coskun and Karabulut Dirican, 2019).

Yoghurt's colour, flavour, nutritional value, usability, and medicinal capacities have all been improved by the addition of fruits during manufacture because consumers tend to dislike artificial food additives (Cakmakc *et al*., 2012). When fruits are combined with yoghurt, which naturally contains pectin and sugar, the yoghurt becomes viscous and more consistent, which

enhances its organoleptic qualities (Nongonierma, 2007). Yoghurt and fruit consumption together may deliver probiotics, prebiotics, high-quality protein, essential fatty acids, and a variety of vitamins and minerals that may have synergistic benefits on health (Fernandez and Marette 2017).

Yoghurt is made with fruit and fruit tastes that aren't often associated with that fruit, such lemon, melon, orange, litchi, and prunes (Routray and Mishra 2011). The *sapindaceae* family's member *litchi* (*Litchi chiensis* L.) is regarded as one of India's most reviving and perishable subtropical fruits. Its pulp and juice are great sources of nutrients and have cooling properties. Therefore, *litchi* is incorporated in milk products such as sweetened honey yoghurt so as to give natural flavour, colour, and other nutritional, pharmacological, and techno-functional advantages. Therefore, in the current study the impact of addition of litchi fruit pulp (2, 4, and 6 %) on the physico-chemical characteristics of the formed yoghurt was investigated just after manufacture and during storage.

MATERIAL AND METHODS

Materials. The study was conducted in the department of Horticulture and Dairy Science and Technology, CCR(P.G.) College, Muzaffarnagar Uttar Pradesh. The buffalo raw milk and skim milk was purchased from local dairy. *Lactobacillus bulgaricus* and *Streptococcus thermophilus* freeze-dried starter cultures were purchased from Absource®Biologics Pvt. Ltd. Maharashtra, India. The local market was used to purchase spray-dried skim milk powder (SMP) under the Nova brand made by Sterling Agro Industry Ltd. in Sonepat, Haryana. The milk was standardised to include the necessary amount of solid not fat (SNF) and fat (F). The addition of low-heat spray-dried skim milk powder of estimated quality was used to increase the milk's SNF concentration. Pectin (high methoxyl) was procured from Central Drug House in New Delhi. From the neighbourhood market, food-grade sugar was purchased.

Litchis (*chinensis Sonn*) of high quality that were unblemished, undamaged, were purchased from the local market of Muzaffarnagar, Uttar Pradesh.

Fruit yoghurt was packaged and stored in polypropylene containers with polythene leak-proof screw-seal closures (100 mL standard cups, Model No: 510010.0, M/s Tarsons Products Pvt. Ltd., Kolkata).

METHODS

Preparation of Fruit Pulp. Desirable characteristics fruit pulp was produced from fresh *litchi* fruit. The stone and the entire damaged area of the fruit were removed then the fruit's skin was peeled off. To make the pulp homogenous, it was homogenised in a blender. The fresh fruit pulp was heated indirectly for 15 seconds at 90°C to blanch it, then cooled and used for the preparation of stirred yoghurt.

Preparation of stirred *Litchi* yoghurt. To achieve the appropriate levels of fat (4.5%) and SNF (8.5%), fresh buffalo milk was standardised. To increase the TS content of the yoghurt milk, honey (at 3%), SMP (2%), and stabiliser (pectin) (at 0.2%) were added to the milk. The details of the manufacturing steps is shown in Fig. 1. The fruit yoghurt after packaging was then chilled, stored and examined for various parameters.

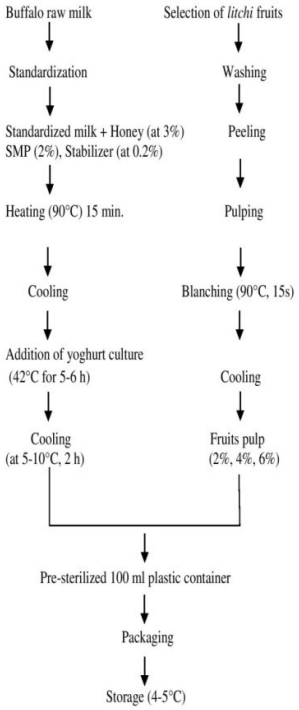


Fig. 1. Flow diagram for the manufacture of *Litchi* (*chinensis Sonn.*) yoghurt

Chemical analysis of fruit. Total soluble solids (TSS), acidity, ascorbic acid, and total phenols were all measured in fruit samples. The fruit's TSS (which ranges from 0-32%) was measured using a hand refractometer. The citric acid in meq./L was used to determine the fruit sample's acidity level (Ranganna, 2002). The AOAC (1990) method was used to measure the ascorbic acid. Using a pH meter, the pH of the fruit sample was examined (Systronics). Fruit's total phenol content was measured following the method of Amorium, (1977).

Chemical analysis of fruit yoghurt. Using a pH meter, the pH of the fruit yoghurt was evaluated (Systronics). The acidity of yoghurt sample was calculated by AOAC (1990). For the estimate of syneresis, Rodarte *et al*. (1993) methodology was used. The method adopted by Strange *et al*. (1977), was used to calculate the tyrosine value.

Statistical Method. Systat, statistical analysis software was used to perform an analysis of variance (ANOVA) on the data gathered for the current study. The 20-day storage period and various treatments (N=3 and control) were compared using the critical difference (CD) at the 5% level of significance (at 5 days intervals).

RESULT AND DISCUSSION

Chemical composition of the raw material. The fruit pulp's high acidity (46.7meq/L) and ascorbic acid content (41.1 mg/100 g) were discovered by chemical analysis (Table 1). The total soluble solid content is quite appreciable in *litchi* fruit (19.0%).

Table 1: Chemical parameters of *litchi* fruit.

Parameters	*Litchi*
Acidity(meq/L)	46.7 ± 9.10
pH	4.98± 0.13
T.S.S (%)	19.0 ± 0.43
Total phenols (mg/100g)	2.11± 0.10
Ascorbic acid (mg/100g)	41.1± 0.49

Values are mean ±S.E. for *n*=3

Physicochemical analysis of yoghurt during storage

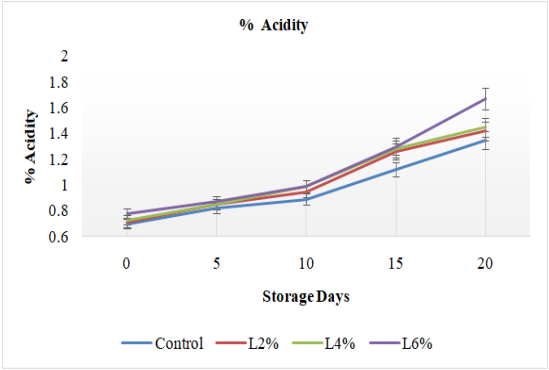
Acidity and pH. Fig. 2A shows the changes in the acidity of plain and *litchi*-flavored honey yoghurt throughout storage. With 6% more fruit pulp added, *litchi* yoghurt had the highest level of acidity. All fruit yoghurt samples showed a significant increase ($p<0.05$) in acidity after storage compared to the control. This can be explained by the fact that the greater acidity of fruits increases the acidity of fruit-blended yoghurt.

The pH alterations for various stirred fruit yoghurt variations are shown in Fig. 2B. The pH of all yoghurt varieties initially varied from 4.5 to 4.66, but on the 20th day of storage, it dropped to 4.07 to 4.01, perhaps due to the development and metabolic activities of acid-forming bacteria (Jayasinghe *et al*., 2015). While there were statistically significant ($p<0.05$) pH fluctuations after storage, adding various amounts of fruit pulp to the designed yoghurts did not result in any discernible differences. Lee and Lucey (2010) concluded that fortification with proteins leads to an increase in the solid content of yoghurt milk, thereby producing an increase in buffering capacity that requires additional acid development by starter cultures to achieve a similar pH target. The results were in agreement with Scibisz *et al.* (2019) who reported similar results with strawberry and blueberry yoghurts.

Syneresis. Conventionally, syneresis is considered a major defect in products that are based on acid-induced gels (Mizrahi, 2010). Consumers perceive the separation of whey (syneresis) from yoghurt during shelf life as a defect, which is a major subject of concern in the dairy industry (Lucey, 2001).

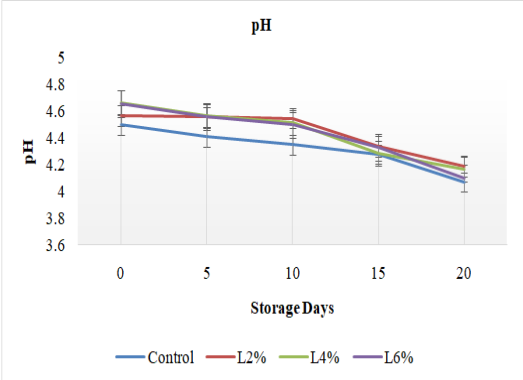
Fig. 3 displays changes in the percentage syneresis of several yoghurt samples during the course of storage. During storage and other treatments, the variation in% syneresis was statistically significant ($p<0.05$). Plain yoghurt initially had a 21.4 percent syneresis, which rose to 25.7 percent on the 20th day of storage. At zero-day, the syneresis of *litchi* yoghurts varied from 22.1 to 25.7%. When fruit pulp was added to plain yoghurt during storage, there was a substantial ($p<0.05$) rise in syneresis. At 6% pulp content, *litchi* yoghurt showed the highest level of syneresis. In the current investigation, fruit yoghurt shows more wheying off than plain yoghurt at all points during the storage period. It could be because yoghurt made with added fruit pulp has a softer body than yoghurt made without it.

Tyrosine value. It is well known that the breakdown of proteins during proteolysis in fermented milk has a significant role in taste development and texture improvement (Ávila *et al.*, 2005). Fig. 4 depicts the information on the effects of *litchi* fruit inclusion on the tyrosine value of yoghurt during storage. Fruit yoghurt's tyrosine content rose considerably ($p<0.05$) throughout storage and different treatments. Fruit yoghurt, as opposed to plain yoghurt, has a reduced value during the course of storage. Tyrosine levels in fruit yoghurt on day 20th of storage ranged from 51.0 to 58.3 mg/g. Tyrosine level may play a role in the indication of bitter taste development in yoghurt. Asperger (1977) previously reported that a bitter taste might become clear when the amount of tyrosine exceeded 0.5 mg/mL in yoghurt. In this study, the tyrosine level was below the threshold value up to the 15th day in all yoghurt samples but after that, it increased significantly and may produce a bitter taste upon sensory evaluation.



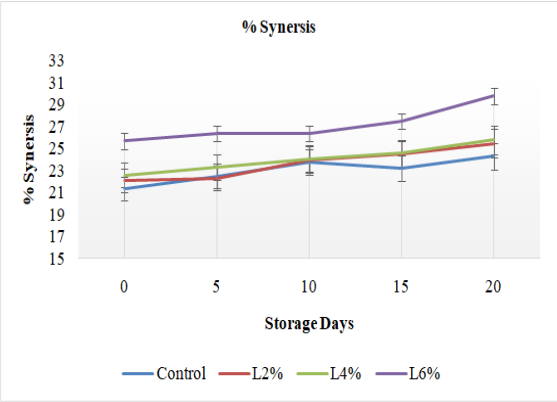
*Treatments -L 2, 4, 6 = *Litchi* pulp @ 2%, 4%, 6% level

Fig. 2 A. Effect of different treatments* and storage on acidity (%) of stirred *litchi* yoghurt.



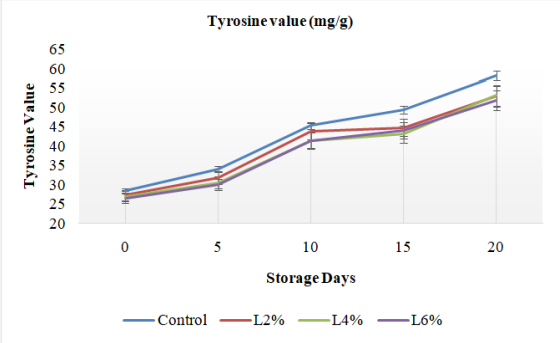
*Treatments -L 2, 4, 6 = *Litchi* pulp @ 2%, 4%, 6% level

Fig. 2B. Effect of different treatments *and storage on pH of stirred *litchi* yoghurt



*Treatments -L 2, 4, 6 = *Litchi* pulp @ 2%, 4%, 6% level

Fig. 3. Effect of different treatments* and storage on syneresis (%) of stirred *litchi* yoghurt.



*Treatments -L 2, 4, 6 = *Litchi* pulp @ 2%, 4%,6% level.

Fig. 4. Effect of different treatments* and storage on Tyrosine value (mg/g) of stirred *litchi* yoghurt.

CONCLUSION

According to the research presented, adding fruit pulp in varying quantities had an impact on the overall quality of stirred fruit yoghurts. Lichi pulp @ 4% concentration, was significantly better in terms of chemical changes. The plain and fruit and honey yoghurt may be kept for up to 15 days at 5°C..The future studies must focus on increasing the shelf life of such products and reducing the increase in syneresis and proteolysis. There is a scope to study the effect of the addition of litchi pulp and honey as sweetener on sensory perception and use of different stabilisers to improve the overall quality of yoghurt.

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Conflict of Interest. None.

REFERENCES

Amorim, H. V., Dougall, D. K., and Sharp, W. R. (1977). The effect of carbohydrate and nitrogen concentration on phenol synthesis in Paul's Scarlet Rose cells grown in tissue culture. *Physiologia Plantarum, 39*(1), 91-95.

AOAC (Association of Official Analytical Chemists). (1990). Official methods of analysis.

Arora, S., (2019). Food safety issues and strategies to improve trade of Indian livestock products. Indian Dairyman, 71(10), 60-67.

Arora, S., Chaudhary, G., Yadav, U., Singh, T. P., & Bathla, S. (2021). Evaluation of physico-chemical and organoleptic characteristics of sweetened stirred plum (*Prunes domestica*) yoghurt during storage. *Indian Journal of Dairy Science, 74*(4).

Aryana, K. J., & Olson, D. W. (2017). A 100-Year Review: Yogurt and other cultured dairy products. *Journal of Dairy Science, 100*(12), 9987-10013.

Asperger, H. (1977). Applicability of analytical methods for the assessment of yogurt quality. In Dairy Sci. Abstr (Vol. 39, No. 1, p. 73).

Çakmakçi, S., Çetin, B., Turgut, T., Gürses, M., & Erdoğan, A. (2012). Probiotic properties, sensory qualities, and storage stability of probiotic banana yogurts. *Turkish Journal of Veterinary & Animal Sciences, 36*(3), 231-237.

Coskun, F., & Karabulut Dirican, L. (2019). Effects of pine honey on the physicochemical, microbiological and sensory properties of probiotic yoghurt. *Food Science and Technology, 39*, 616-625.

EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA). (2010). Scientific Opinion on the substantiation of health claims related to live yoghurt cultures and improved lactose digestion (ID 1143, 2976) pursuant to Article 13 (1) of Regulation (EC) No 1924/2006. *EFSA Journal, 8*(10), 1763.

Fazilah, N. F., Ariff, A. B., Khayat, M. E., Rios-Solis, L., & Halim, M. (2018). Influence of probiotics, prebiotics, synbiotics and bioactive phytochemicals on the formulation of functional yogurt. *Journal of Functional Foods, 48*, 387-399.

Fernandez, M. A., & Marette, A. (2017). Potential health benefits of combining yogurt and fruits based on their probiotic and prebiotic properties. *Advances in Nutrition, 8*(1), 155S-164S.

Garde, S., Medina, M., & Nuñez, M. (2005). Effect of milk inoculation with bacteriocin-producing lactic acid bacteria on a *Lactobacillus helveticus* adjunct cheese culture. *Journal of food protection, 68*(5), 1026-1033.

Jayasinghe, O., Fernando, S., Jayamanne, V., & Hettiarachchi, D. (2015). Production of a novel fruit-yoghurt using dragon fruit (*Hylocereus undatus* L.). *European Scientific Journal, 11*(3).

Lee, W. J., & Lucey, J. A. (2010). Formation and physical properties of yogurt. *Asian-Australasian Journal of Animal Sciences, 23*(9), 1127-1136.

Lucey, J. A. (2001). The relationship between rheological parameters and whey separation in milk gels. *Food Hydrocolloids, 15*(4-6), 603-608.

Mizrahi, S. (2010). Syneresis in food gels and its implications for food quality. In Chemical deterioration and physical instability of food and beverages (pp. 324-348). Woodhead Publishing.

Nongonierma, A. B., Cayot, P., Springett, M., Le Quéré, J. L., Cachon, R., & Voilley, A. (2007). Transfers of small analytes in a multiphasic stirred fruit yoghurt model. *Food hydrocolloids, 21*(2), 287-296.

Peng, Y., Serra, M., Horne, D. S., & Lucey, J. A. (2009). Effect of fortification with various types of milk proteins on the rheological properties and permeability of nonfat set yogurt. *Journal of food science, 74*(9), C666-C673.

Popa, D., & Ustunol, Z. (2011). Sensory attributes of low-fat strawberry yoghurt as influenced by honey from different floral sources, sucrose and high-fructose corn

sweetener. *International Journal of Dairy Technology, 64*(3), 451-454.

Ranganna, S. (2002). Hand Book of Analysis of quality control for fruit and Vegetables products 2nd Ed. TATA Megraw Hill pub. Co. Ltd. New Delhi, 1038-1040.

Routray, W., & Mishra, H. N. (2011). Scientific and technical aspects of yogurt aroma and taste: a review. *Comprehensive Reviews in Food Science and Food Safety, 10*(4), 208-220.

Savaiano, D. A. (2014). Lactose digestion from yogurt: mechanism and relevance. *The American journal of clinical nutrition, 99*(5), 1251S-1255S.

Ścibisz, M., Ziarno, M. and Mitek, M. (2019) Color stability of fruit yogurt during storage. *Journal of Food Science and Technology, 56*, 1997–2009.

SERT, D., Akin, N., & Dertli, E. (2011). Effects of sunflower honey on the physicochemical, microbiological and sensory characteristics in set type yoghurt during refrigerated storage. *International journal of dairy technology, 64(*1), 99-107.

Sharanagouda, B., Shankarlingayya, V.S., Arora, S. (2019). Optimization of inoculation level of probiotics (*L. acidophilus* LA5 & amp; *B. bifidum* BB12) on the quality parameters of whey protein enriched probiotic concentrated yoghurt. *Haryana Veterinarian, 58*: 220-223.

Strange, E. D., Benedict, R. C., Smith, J. L., & Swift, C. E. (1977). Evaluation of rapid tests for monitoring alterations in meat quality during storage: I. Intact meat. *Journal of Food Protection, 40*(12), 843-847.

Wacher-Rodarte, C., Galvan, M. V., Farres, A., Gallardo, F., Marshall, V. M., & Garcia-Garibay, M. (1993). Yogurt production from reconstituted skim milk powders using different polymer and non-polymer forming starter cultures. *Journal of dairy research, 60*(2), 247-254.

Weerathilake, W. A. D. V., Rasika, D. M. D., Ruwanmali, J. K. U., & Munasinghe, M. A. D. D. (2014). The evolution, processing, varieties and health benefits of yogurt. *International Journal of Scientific and Research Publications, 4*(4), 1-10.

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