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SHORT COMMUNICATION

Standardisation and quality evaluation of betel leaf based yoghurt

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Abstract: Yoghurts are those milk products which are fermented and have a good impact on the human health. Incorporation of herbs or medicinal plants into the yoghurt, can improve the variety as well as the nutritional and therapeutic benefit of the yoghurt. The present study aimed at developing yoghurt incorporated with betel leaf extract and was successful. The incorporation of 15% betel leaf extract had better organoleptic qualities when compared to the other treatments. The selected yoghurt was stored for 15 days in refrigerated condition and was subjected to organoleptic and nutritional evaluation. The organoleptic scores gradually decreased during storage. Physico-chemical parameters such as moisture, water holding capacity, and syneresis were significantly decreased as the storage period increased. The nutritional components such as energy and carbohydrate were also significantly different as the storage period was extended. Further studies have to be carried out to understand the shelf stability and medicinal properties of the prepared yoghurt.

Keywords: Yoghurt, Betel leaf, Medicinal plants, Herbs

Yoghurt has a good impact on human health because they include a variety of bioactive proteins, hydrolyzed carbohydrates, vitamins, and minerals with enhanced bioavailability. *Streptococcus salivarius* subsp. *thermophilus* (SST) and *Lactobacillus delbrueckii* strain. *bulgaricus* (LDB) are used in cooperation to develop yoghurt (Deshwal et al. 2021). Nutritional value and therapeutic potential of yoghurt can both be enhanced by including herbs or medicinal plants such as betel leaves. Betel leaves (*Piper betle L.)* are rich sources of flavonoids, terpenoids, tannins, alkaloids and many bioactive compounds which make it a suitable choice for several therapeutic preparations (Chauhan et al. 2016). In line with the rising demand for such herbal foods, the present research is being done to develop betel leaves based yoghurt.

Betel leaf based yoghurt was prepared by adding the fresh leaf juice to a mixture of preheated milk, skimmed milk powder (1%) and sugar (8%). The mixture was pasteurised, cooled to 55°C and yoghurt culture (2%) was added. The yoghurt was incubated at 42°C for 8 hours and then refrigerated at 4°C. Various treatments were used to standardise the percentage incorporation of betel leaf by modifying the milk and juice ratio. A best treatment was selected through organoleptic evaluation and the selected treatment underwent further evaluations.

Organoleptic evaluations preferred plain yoghurt to betel leaf yoghurts, although the most palatable betel leaf yoghurt was produced by combining 15% betel leaf extract with 85% homogenized milk. Even though, the organoleptic scores decreased during storage, the yoghurt was still acceptable till 15 days. According to a study by Mazumder (2019), dahi was well-accepted when betel leaf extract was added at a rate of 2%. The physic-chemical and nutritional constituents of the prepared yoghurt were studied initially and at five days intervals. Table 1 details the physic-chemical and nutritional constituents recorded during the storage period. The initial moisture content of the betel leaf yoghurt was 76.42%, and it gradually increased during storage. Betel leaf dahi (Mazumder, 2019) had a moisture content that was higher than that of the current study (81.56%). Similar to betel leaf dahi, acidity of the yoghurt in the present also rose from 0.68% to 0.89% during storage. The phenolic compounds in the betel leaf may have prevented the development of acidity

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Table 1: Physico-chemical and nutritional constituents of the betel leaf based yoghurt during storage

Components	Day 1	Day 5	Day 10	Day 15	C.D. Value
Moisture (%)	76.42[c]	77.02[bc]	78.54[ab]	79.14[a]	1.809
Acidity (%)	0.68	0.75	0.81	0.89	NS
pH	4.43	4.21	3.84	3.49	NS
Water holding capacity (%)	57.32[a]	56.85[a]	54.25[b]	51.05[c]	2.788
Syneresis (%)	1.00[b]	1.70[ab]	2.30[a]	2.70[a]	1.031
Energy (Kcal)	80.84a	76.48b	73.11c	66.49d	2.146
Carbohydrate (g)	7.97a	7.52ab	6.98b	6.23c	0.960
Protein(g)	9.54	9.35	9.16	8.93	NS
Fat (g)	1.20	1.00	0.95	0.65	NS
Total sugar(g)	9.27	9.14	8.68	8.21	NS
Reducing sugar (g)	5.17	5.10	5.03	4.95	NS
Vitamin A (IU)	2.10	1.98	1.87	1.74	NS
Vitamin C (mg)	0.89	0.88	0.86	0.83	NS

DMRT row wise comparison, NS – Non Significant

(Kriangkrai and Penkhae, 2009). The pH ranged from 4.43, which falls within the recommended pH range of 4.6 for yoghurt. Sugar fermentation and lactic acid generation by microbial activities may be the cause for the pH decrease. Starting at 57.32%, water holding capacity (WHC) decreased to 51.05% on day 15, indicating a less robust gel network. The consistency and hardness of dahi may be affected by betel leaf extract. Syneresis in betel leaf yoghurt ranged from 1% to 2.70%. Syneresis, which happens when the gel network loses its ability to maintain the serum phase, results in whey separation during yoghurt storage and can affect customer acceptability Joon et al. (2017).

Essential nutrients like carbohydrates, proteins, lipids, vitamin A, and vitamin C was enhanced by the addition of betel leaf extract to yoghurt. By the fifteenth day of storage, the amounts of reducing sugar and total sugar had fallen from 5.17g and 9.27g to 4.95g and 8.21g, respectively. 7.97g/100g of carbohydrates were present. While in storage, the protein content drastically dropped but stayed at 9.54g/100g. Due to the enzymatic activity of lipase and lipoxidase produced by the microorganisms, the fat content gradually decreased (Mao et al. 2022). The amount of vitamin A ranged from 2.10IU to 1.74IU, and the amount of vitamin C increased with the addition of betel leaves, falling from 0.89 mg to 0.83mg over the course of storage.

Conclusion

The study aimed at developing a betel leaf based yoghurt, wherein the incorporation of 15 per cent of betel leaf extract was found to have better organoleptic qualities compared to other treatments. As the storage period increased, there were decline in the sensory qualities and also variations in the nutritional constituents. The study should be further continued to understand the shelf stability of the yoghurt. Also the evaluation of the medicinal properties of the prepared yoghurt can thus make us understand its therapeutic properties. It can thus be understood that betel leaf incorporation can bring a variety to the yoghurt flavour, however, further studies can help to reveal its nutritional and medicinal properties

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