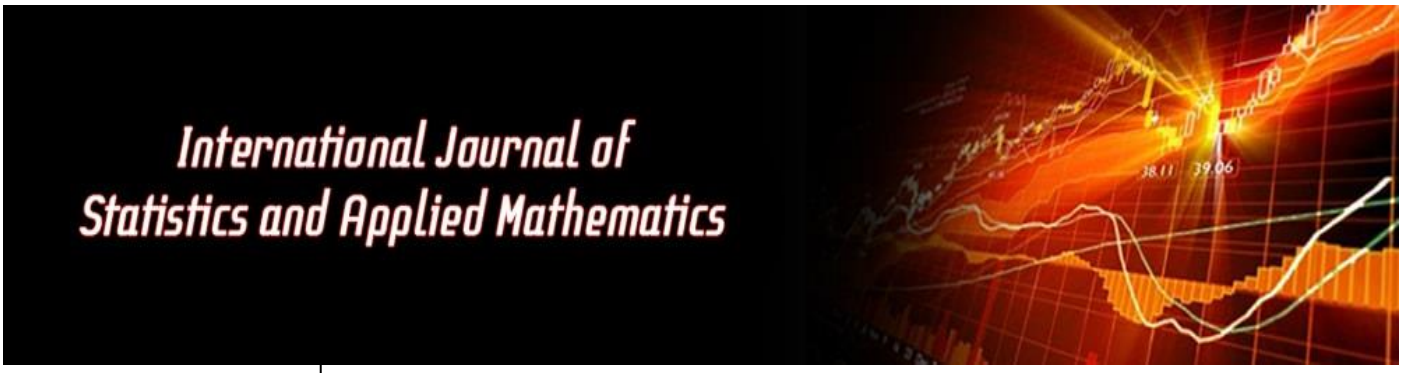

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Simulating techniques for storage study of dietary peda enriched with flaxseed powder

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Abstract
India is the leading milk producer in world with annual production of 221.1 million tons. The nation is having vast potential for traditional Indian dairy products (TIDPs) including khoa, Peda, rasogolla etc. Peda is the prime consuming product in northern Indian states. It is prepared from Pindi variety of Khoa. To improve the dietary value of Peda, flaxseeds are added at different concentration (2.0, 2.5 and 3.0% on w/w basis). Stevia was added as natural sweetener at 0. 0.375% of khoa. The prepared Peda samples were examined for chemical properties after preparation and during storage of 3, 6, 9, 12 and 15 days. Computational models were developed to predict the chemical changes during storage period.

Keywords: Different concentration, Peda, flaxseeds

1. Introduction
Over the past six years, milk production has seen a substantial yearly growth of 6.3%, as reported by the Union Ministry for Fisheries, Animal Husbandry, and Dairying. This remarkable achievement in the dairy sector has garnered recognition through the prestigious Gopal Ratan Award, presented by the Ministry. According to a report from the Indo-Arabian News Service in 2021, the state of Uttar Pradesh has particularly excelled in this regard. Milk production in Uttar Pradesh has witnessed a substantial rise, increasing from 277.697 lakh metric tonnes in 2016-17 to an impressive 318.630 lakh metric tonnes in 2019-20. This substantial increase accounts for 18% of the national total, establishing Uttar Pradesh as a major contributor to India's burgeoning dairy industry.
Anticipated for the year 2020, worldwide milk production is poised to attain an impressive milestone, reaching 906 million tonnes, representing a substantial 7.4% increase from the preceding year (as per the Food Outlook report in November 2021). India, a prominent player in this global landscape, contributes a noteworthy 21% to the overall milk production, solidifying its position as the world's foremost milk producer. Notably, traditional dairy products hold immense commercial significance, constituting over 90% of the entire spectrum of dairy items consumed within the country (Aggarwal *et al.*, 2018) [1]. Because of cutting-edge process technology, the TIDP industry is primed for rapid growth. It is expected that the consumption rate of TIDP will higher than the production demand of western dairy products. India's traditional dairy offerings open the door to burgeoning business prospects. Crafting liquid milk and creating milk-based delicacies has been a cherished tradition passed down through the ages (Bankar *et al.* 2013) [4]. The addition of nutraceuticals into Peda leads to preparation of dietary Peda. Flaxseeds are gaining recognition as a 'superfood,' supported by a growing body of scientific research highlighting their remarkable health advantages. These tiny powerhouses are rich in omega-3 fatty acids, particularly alpha-linolenic acid, and are abundant in lignans, including Secoisolariciresinol di glucoside (SDG). Omega-3 fatty acids are renowned for their anti-inflammatory, anti-thrombotic, and anti-arrhythmic properties. The health community, including nutritionists and medical experts, is showing an increasing interest in flaxseeds due to the potential health benefits they offer (Gupta and Mishra, 2021) [6]. Flax seed has a very healthy fatty acid profile with high concentrations of PUFA (73%)

(Ferrazzano *et al*., 2015) [5]. The development of TIDPs and storage stability of these products is a matter of serious concern due to the higher time and resource wastage. So, the development of computational models is need of the hour to predict the shelf-life of TIDPs as well as for the right selection of packaging material for TIDPs (Ahmad *et al*., 2020) [2].

2. Methodology

2.1 Preparation of Flaxseed enriched dietary Peda

Milk was collected from dairy farm, Department of Dairy Science and Food Technology, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (UP). Flaxseed and stevia were purchased from local market. The method of preparation of flaxseed enriched dietary Peda (2.0% concentration) was adopted from literature study with some modifications. The preparation steps are given below:

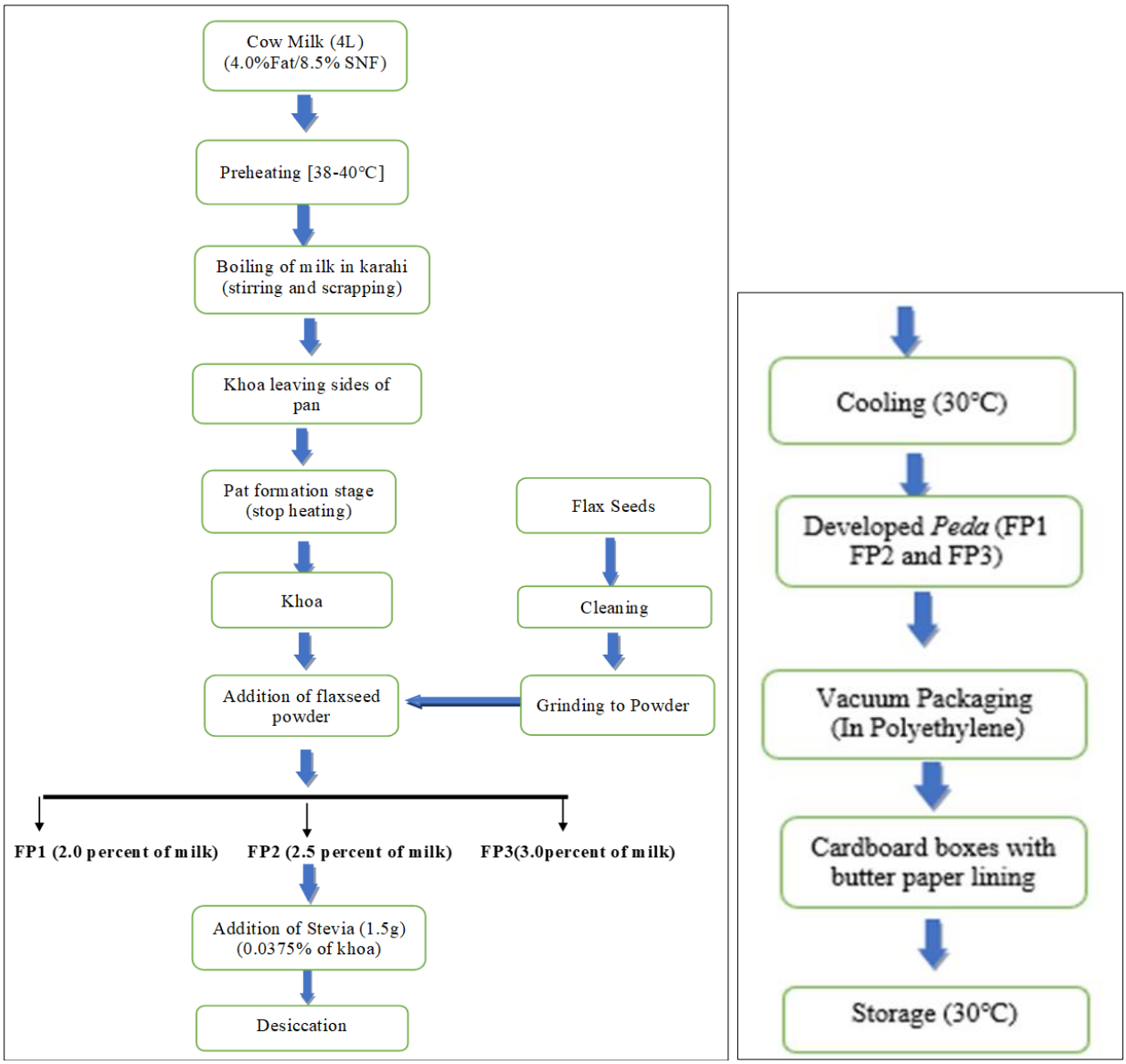

Fig 1: Preparation of flaxseed enriched dietary Peda

2.2 Examining the chemical parameters of flaxseed enriched Peda

For examining the chemical parameters of flaxseed enriched Peda, storage study was conducted at 25 °C for 0, 3, 6, 9, 12 and 15 days. The Peda sample with 2.0% flaxseed powder was chosen for storage study examination.

2.2.1 Moisture: The moisture and total solids in Peda samples were determined in accordance with the methods specified in IS: (SP: 18, Part XI) (1981).

2.2.2 Acidity

Titratable acidity *Khoa* samples was determined as per the method described in IS: (SP: 18, Part XI) (1981) for estimation of acidity in cheese. The method was modified and the procedure in brief is as follows:

To determine the Titratable acidity of *Khoa* samples, 10 g sample was weighed into volumetric flasks of 100 mL capacity. Hot water was added to the flask until the mark and then 5 mL more was added using a pipette. After closing the lid, the flask was vigorously stirred. Then the suspension formed was filtered using Whatman no. 1 filter paper. Then, 25 mL filtrate was taken in a conical flask, phenolphthalein indicator of about 1 mL was added to it and mixed well. The titration was carried out with 0.1 NaOH solution introduced drop by drop from the burette until a pink colour change was observed. The sample for estimation of acidity was prepared

in duplicate. Titratable acidity is represented in millilitre of 0.1 N NaOH per 10 grams of product.

$$\text{Titratable acidity as per (\% LA)} = \frac{9 \times N \times V}{W}$$

Where
N= Normality of solution
V= Volume of solution
W = Weight of Sample

2.2.3 Free fatty acid (% LA)
The free fatty acids (FFA) content was determined as per the procedure described by Vekariya *et al.*, (2013). Extraction of FFA was carried out from 5g of homogenous brown *Peda* sample once with a mixture of 4 mL ethyl alcohol (95%), 7 mL diethyl ether and 10 mL petroleum ether and 10 mL petroleum ether. The extracts were pooled in a conical flask and titrated with 0.02 N sodium hydroxide solution using 0.5 mL of phenolphthalein indicator till pink colour end point was reached. The FFA content was calculated using formula as follows:

$$\text{FFA (\% oleic acid)} = \frac{2.82 \times T}{5 \times W}$$

Where
T = Titrate in mL
W = Weight of sample taken in gram

Development of computational models
The obtained results were used to develop the simulated models using Microsoft Excel (MS) software.

3. Results and Discussion
The obtained results are represented below in graphical form:

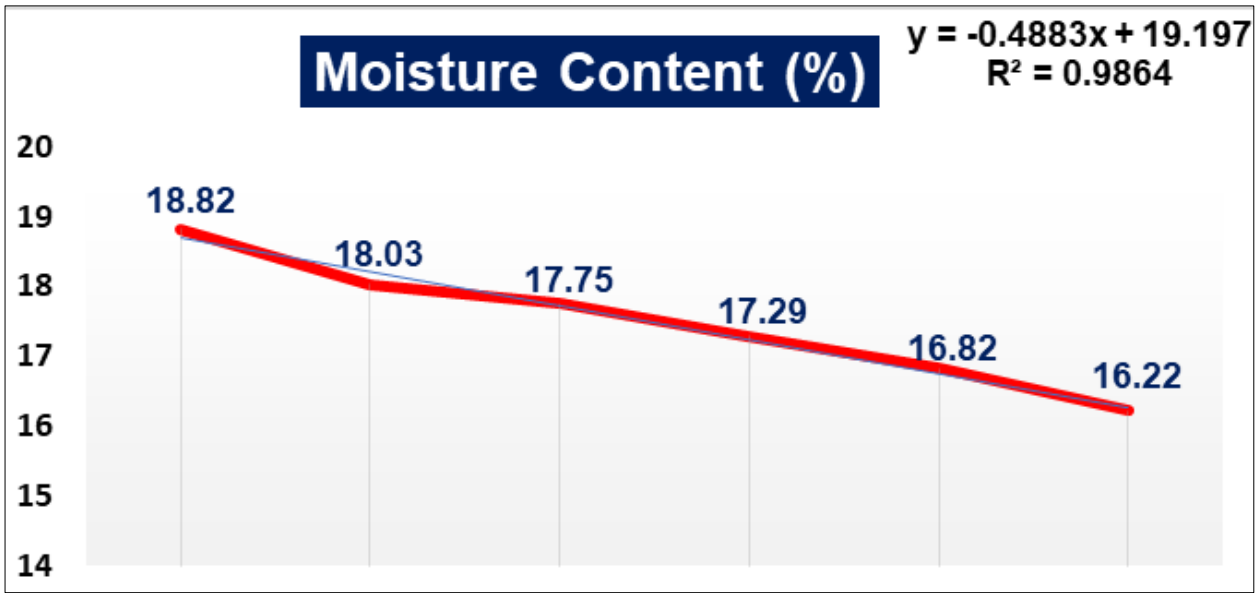

Fig 2: Moisture curve for flaxseed enriched Peda during 0, 3, 6, 9, 12 and 15 days at 7 °C

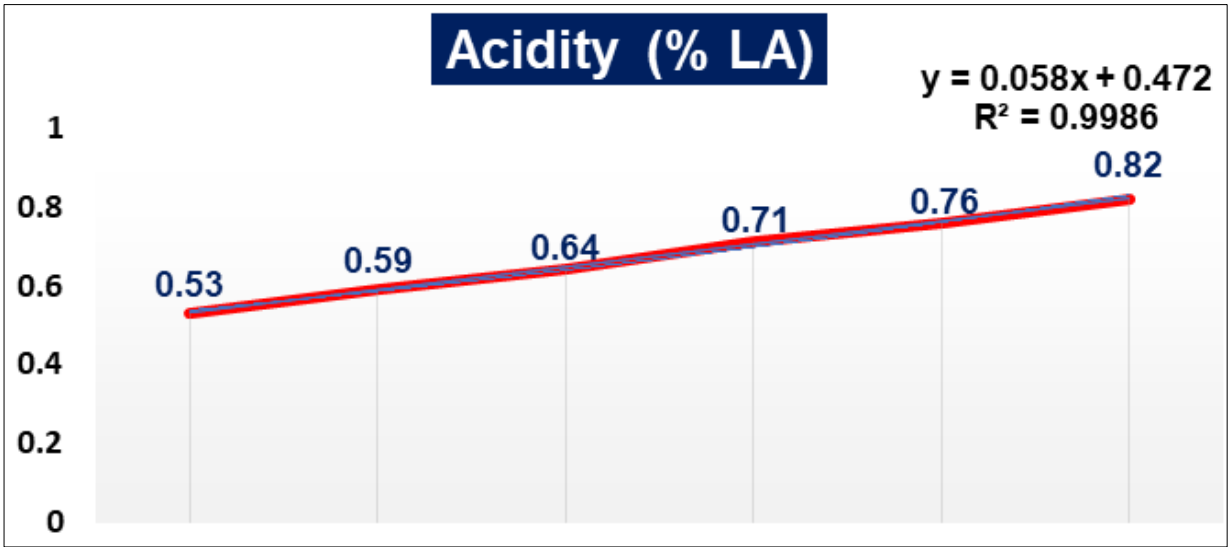

Fig 3: Moisture curve for flaxseed enriched Peda during 0, 3, 6, 9, 12 and 15 days at 7 °C

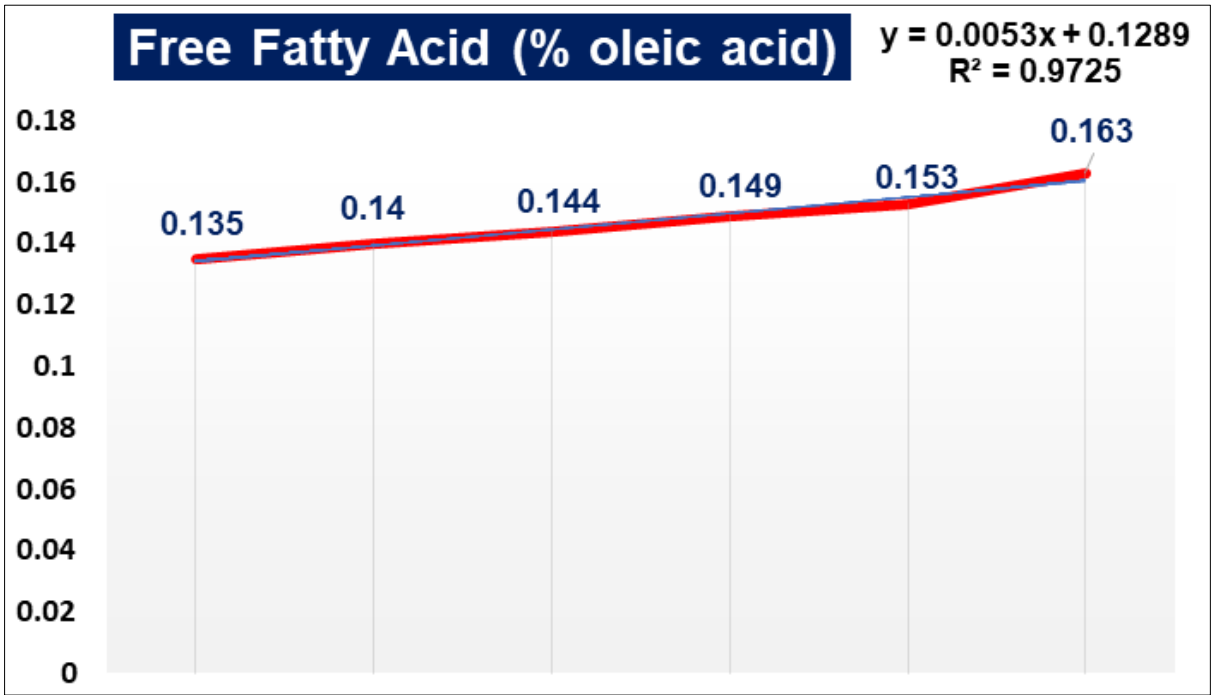

Fig 4: Moisture curve for flaxseed enriched Peda during 0, 3, 6, 9, 12 and 15 days at 7 °C

The moisture content of Peda decreased from 18. 82 to 16.22% during storage at 7 °C for 0 to 15 days. The equation for the change is written along with the respective graph (Fig. 2). The R^2 value was 0.9864 for moisture prediction curve. The acidity value of Peda increased from 0.53 to 0.82 during storage at 7 °C for 0 to 15 days. The equation for the change is written along with the respective graph (Fig. 3). The R^2 value was 0.9986 for acidity prediction curve.

The free fatty acid (% oleic acid) of Peda decreased from 0.135 to 0.163 during storage at 7 °C for 0 to 15 days. The equation for the change is written along with the respective graph (Fig. 4). The R^2 value was 0.9725 for free fatty acid (% oleic acid) prediction curve.

4. Conclusion

The moisture content, acidity (% LA) and free fatty acid (% oleic acid) values were reported as 18.82, 0.53 and 0.135 for dietary Peda enriched with 2.0% flaxseed. The increasing trend was noticed for acidity (% LA) and free fatty acid (% oleic acid) while moisture content showed decreasing trend over the storage study. The simulated models were formulated using MS Excel 2019 for predicting the moisture, acidity (% LA) and free fatty acid (% oleic acid) of dietary Peda enriched with 2.0% flaxseed. The developed models had coefficient of correlation (R^2) were close to one.

5. References

1. Aggarwal D, Raju PN, Alam T, Sabikhi L, Arora B. Advances in processing of heat desiccated traditional dairy foods of Indian sub-continent and their marketing potential. Food Nutrition Journal. 2018;18:1-17.
2. Ahmad J, Khan I, Blundell R, Azzopardi J, Mahomoodally MF. *Stevia rebaudiana* Bertoni. An updated review of its health benefits, industrial applications and safety. Trends in Food Science & Technology. 2020;100:177-189.
3. Araújo AV, Queiroz DMD, Arcanjo GS, Dias SHB, Alves RM, Pinto FDADC, *et al*. Increasing yoghurt daily production with modeling and simulation process. Ciência Rural; c2019. p. 49.
4. Bankar SN, Barbind RP, Korake RL, Gaikwad SY, Bhutkar SS. Studies on preparation of pineapple burfi. Asian Journal of Dairying & Foods Research. 2013;32(1):40-45.
5. Ferrazzano GF, Cantile T, Alcidi B, Coda M, Ingenito A, Zarrelli A, *et al*. Is *Stevia rebaudiana* Bertoni a non-cariogenic sweetener? A review. Molecules. 2015;21(1):38.
6. Gupta E, Mishra P. Functional food with some health benefits, so called superfood: A review. Current Nutrition and Food Science. 2021;17(2):144-166.
7. Hirpara P, Prajapati JP, Mehta BM, Pinto SV. Development of Thabdi milk sweets of Gujarat State, India utilizing Ghee residue as an ingredient. Journal of Applied and Natural Science. 2020;12(4):575-581.
8. Lomate GB, Dandi B, Mishra S. Development of antimicrobial LDPE/Cu nanocomposite food packaging film for extended shelf life of Peda. Food packaging and shelf life. 2018;16:211-219.
9. Londhe G, Pal D, Raju PN. Effect of packaging techniques on shelf life of brown Peda, a milk-based confection. LWT-Food Science and Technology. 2012;47(1):117-125.
10. Oomah BD. Flaxseed as a functional food source. Journal of the Science of Food and Agriculture. 2001;81(9):889-894.
11. Oomah BD, Mazza G. Flaxseed proteins: A Review Food Chemistry. 2003;48:109-114.