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Preparation of Honey based, High Calorie Cum Fibre Passion Fruit-Dry Apricot- Flaxseed Bar

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***Abstract*— Changing lifestyle, brings a significant change in consumption of diet. Fruit bars can also be considered as snacks with good sensory and nutritional characteristics. They also content high protein, vitamin and minerals content. Different fruits are being processed to formulate different fruit bars, which are ready to use and attract all age group to meet their energy and protein needs. In the present work, an attempt was made to prepare comparatively high nutrient honey based passion fruit pulp bar by mixing with dry apricot pulp and flax seed powder. Three formulated bars were prepared by mixing passion fruit pulp, dry apricot pulp and flaxseed powder in the ratio 85:10:5(w/w), 80:10:10(w/w) and 75:10:15(w/w) and they were marked as B1, B2 & B3. These bar were compared with control bar (B0) prepared from passion fruit pulp and sugar. All bars were tested for moisture content, ash, crude fibre, protein, fat, acidity and ascorbic acid, calorific values. Mineral content such as calcium, sodium and potassium were determined as per standard laboratory methods. Results of sensory evaluation and chemical analysis showed that among all bars B2 was found to be higher in fat (2 times B0), calories (1.9 times B0) and fibre (1.26 times B0) respectively. All the bar formulations were tested for alkaloid toxicity by HPLC method and found to be absence in alkaloid harmane and harmine.**

Keywords*— *Dry Apricot, Flaxseed Powder, Fruit Bar, High Calorie, Honey, Passion Fruit

I. INTRODUCTION

Fruits played a very important role in human history for supplying energy and nutrients. Due to their perishable nature, fruits need to be processed and preserved [1]. Passion fruit is one
of the sessional fruit, rich in mineral, fibres and vitamins, especially A and C. It juice also have wonderful aroma and flavor, increasing its demand in the soft drink industry [1-2]. Passion fruit is a native of Brazil, belonging to the family Passifloraceae. In India passion fruit are produces in North-east region, especially in Manipur and Meghalaya [1, 3]. There are two recognized forms of edible passion fruit; purple and yellow [2].

Apricot is basically native of Turkey, but it can be grown throughout the world including hilly states of India i.e. Jammu and Kashmir, Himachal Pradesh and Uttarakhand. Apricot also considered as one of the most delicious temperate fruits [4]. It is rich source of carbohydrate, minerals, fibres and also have attractive color and flavor [5]. Dried apricots contains 3 times more potassium than bananas and contain only trace of salt that helps to keep down blood pressure. It also helps to keep digestive system good and reduces cholesterol level from blood [6].

Flaxseed or linseed (Linum Usitatissimmum), also known as Alsi, Jawas, Aksebija in Indian regional languages, a member of family Linaceae [7]. Flaxseed is an ancient crop mainly considered as oil seed crop. Beside its oil content it also content, high amount of dietary fibres (both soluble and insoluble) protein, lignin, and α Linoleic acid or omega-3 fatty acid [7-10]. Several studies reveal that these compounds work well for nutritional benefits in human being. For ex. ALA is beneficial for brain development, reducing blood lipids and risk of cardiovascular diseases [10]. Flaxseed dietary fibre exhibits positive effect to reduce constipation [7]. Thus these nutrients make flaxseed an appealing functional food ingredient.

Honey has been used as a sweetener, food and medical product since the ancient times [11]. In most ancient cultures honey was used for both nutritional and medical purpose [11-13]. Honey mainly consist of glucose and fructose and other major constituents is water. Honey also contains small amount of vitamins and minerals, which table sugar doesn't contain [14]. Honey has beneficial effect over table sugar, as it has low glycemic index than sugar. Honey glycemic index (48-55 or even lower depend on fructose content in batch), sugar glycemic index (58-65). Low glycemic index results in slower adsorption of sugar in blood and slower digestion. It helps in proper insulin secretion and helps to reduce the chances of diabetes and cardiovascular diseases [14-15]. In present study honey is used as sweetener.

Due to change in lifestyle, fast food and snacks consumption increased significantly in recent few years. This also includes the consumption of high calorie prepared, frozen and ready food. But some of these food leads to the problems like obesity, diabetes, etc. Fruit bars can also be considered as snacks with good sensory and nutritional characteristics due to their high protein, vitamin and minerals content. Different fruits are being processed to formulate fruit bars, which are ready to use and attract all age group to meet their energy and protein needs [6]. These bars contain fruits, cereals and legumes as a major ingredient along with nuts, chocolates coatings or chips.

Commonly fruit bars were prepared by drying fruit pulp followed by mixing it with appropriate quantities of sugar, pectin, acid and color [16]. It can be prepared from a wide variety of fruits including guava, mango, sapota, banana, papaya, apple, jackfruit, etc. [17-18]. Many of the commercially available fruit bars are without fruit pulp and synthetic in nature. Natural fruit pulp based fruit bars are more nutritious and accepted widely they contain good quantities of dietary fibres, minerals and vitamins in finished products [19].

The present study was conducted to develop passion fruit-apricot-flaxseed bars by using different proportions of passion fruit pulp, dry apricot pulp and flaxseed powder. Honey is used as a sweetener to improve the energy content of the product. The final bars are evaluated sensory and for chemical characteristics.

II. Material and Methods

The present investigation is carried out at Department of Food Technology, UICT, NMU, Jalgaon Maharashtra. Mature purple passion fruit, dried apricot and flaxseed were purchased from the local market of Jalgaon, Maharashtra. Daber honey is used in the present study as a source of sweetener. All other ingredients such as olive oil, pectin, maltodextrin, salt, skim milk powder etc. are procured from the local market of Jalgaon, Maharashtra.

Preparation:

Passion fruit pulp was prepared by following the method described by S. N. Konhikar et. al. [21] as shown in figure 1. The mature fruits were washed and cut down into pieces. Seeds were separated from the pieces and gain cut down into smaller pieces. Balancing was carried out for 20 min followed by grinding and finally pulp is stored at 5-6 0C in refrigerator by adding sodium benzoate (0.1 wt%) as preservative in glass bottles.

Dry apricot were sorted and washed for making pulp. Heated for 5-7 min by adding some water in it. Finally grind to make the pulp and stored in glass bottles under refrigerated condition [22].

Flaxseed powder was prepared from flaxseed by following the method described by S. Hussain et. al. [22]. The flaxseed were roasted first at 90 ^{0}C for 10 min followed by grinding and finally passed through the fine mesh (250µm) to remove large particles. The powder was stored in HDPE bags.

Passion fruit-apricot-flaxseed bars were prepared in 3 different combinations were labelled as B1 (85% passion fruit pulp: 10% dry apricot pulp: 05% flaxseed powder by weight), B2 (80% passion fruit pulp: 10% dry apricot pulp: 10% flaxseed powder by weight) and B3 (75% passion fruit pulp: 10% dry apricot pulp: 15% flaxseed powder by weight). The other ingredients used were shown in the table 1. The control bar was prepared by taking 100% passion fruit and sugar as sweetener and labelled as B0.

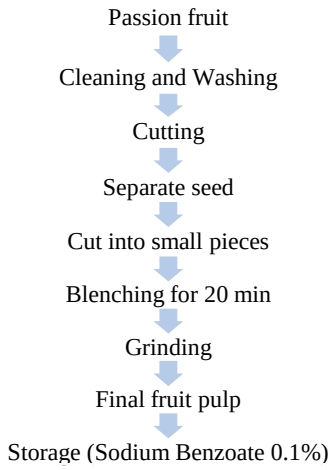


Figure1: Flow chart for passion fruit pulp preparation

Passion fruit bars were prepared by following the procedure described in figure 2 by S. K. Sharma et. al. [19]. The passion fruit pulp and flaxseed powder was mixed in fixed proportion and boiled the mixture at low flame till its volume becomes half. Honey and apricot pulp were added with continuous mixing followed by sprinkling of pectin and other ingredients. The mixture was homogenized and poured into aluminum tray coated with olive oil. The mixture was spread uniformly using S.S. spread and a thickness of 4-5 cm was maintained. The trays were kept for drying at 50-60 ^{0}C in mechanical dryer. Finally the trays were cooled and the bars were cut in rectangular pieces (2.5 x 4 cm^2). The samples were wrapped with aluminum foil and stored in HDPE bags for chemical analysis and sensory evaluation. The prepared bars were shown in figure 3.

TABLE I- Formulation ingredient of passion fruit –apricot–flaxseed Bar

Sample / Raw Material	Control Bar (B0)	Bar 1 (B1)	Bar 2 (B2)	Bar 3 (B3)
Passion fruit pulp	100 gm	85 gm	80 gm	75 gm
Apricot pulp	-	10 gm	10 gm	10 gm
Flaxseed powder	-	5 gm	10 gm	15 gm
Sugar	55 gm	-	-	-
Honey		45 gm	45 gm	45 gm
Pectin	2 gm	2 gm	2 gm	2 gm
Citric acid	0.2 gm	0.2 gm	0.2 gm	0.2 gm
SMP	15 gm	15 gm	15 gm	15 gm
Maltodextrin	2 gm	2 gm	2 gm	2 gm
Sodium benzoate	0.1 gm	0.1 gm	0.1 gm	0.1 gm

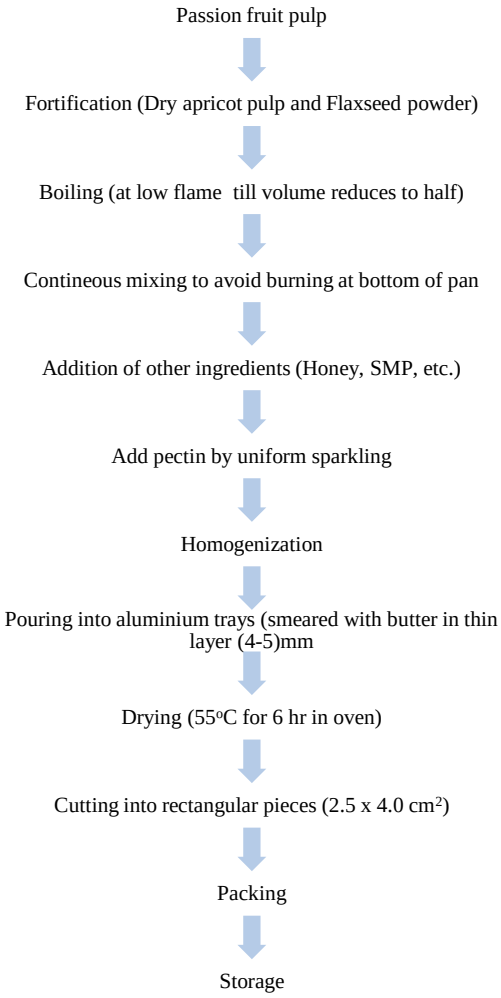


Figure 2: Flow chart for passion fruit bar preparation

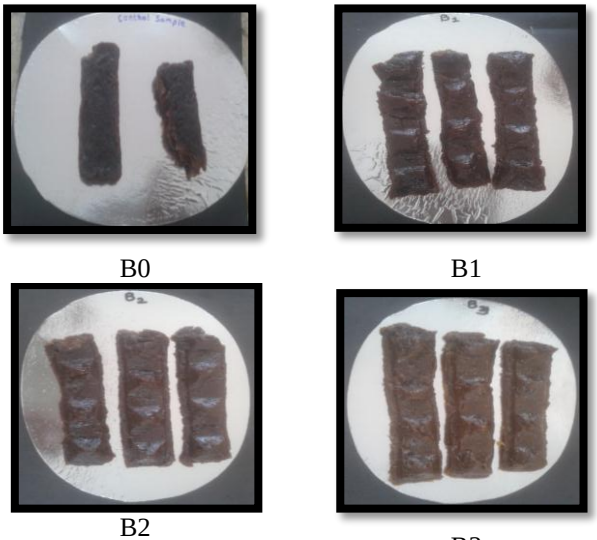


Figure3: Images of Passion Fruit Bar

Analysis:

The raw material and final products were analysis for Moisture content, Ash content, Crude Fat, Crude Fibre, Protein, Total Titratable Acidity, Reducing and Total sugar, Ascorbic acid content was determined as per standard methods given by Ranganna [20]. Calcium, sodium and potassium was determined by the use of Flame photometer (ELICO CL378). Calories were measured by using digital bomb calorimeter (model RSB6).

III. Result and Discussion

Raw material analysis: The proximate analysis of raw material was carried out. Passion fruit found to contain 97 Kcal/100gm energy; 2.1% protein, 10.4% crude fibre; 30 mg/100 gm ascorbic acid and minerals like sodium (28mg/100gm), calcium (12mg/100gm) and potassium (348mg/100gm). Honey contained 304 Kcal/100gm energy and negligible amount of protein, fibre, etc. Dry apricot pulp contains 7% fibre and around 5% protein, 48 Kcal/100gm energy and minerals like sodium (13mg/100gm), calcium (13mg/100gm) and potassium (260mg/100gm). Flaxseed powder contains 32% fat; 21% protein and 27% fibre. Calories content was found to be 470 Kcal/100gm and minerals contained was sodium (30mg/100gm), calcium (255mg/100gm) and potassium (813mg/100gm).

Bar Analysis:

Sensory –The sensory evaluation of passion fruit bars were carried out according to the standard procedure on a 9 point hedonic scale. The mean score of 10 semi trained judges for each quality parameter i.e. color, appearance and texture, taste, flavor and overall acceptability was recorded and the graph is as shown in figure 4. From scores of all the bar formulations B0, B1, B2 and B3, the B2 bar shows the best result. Score for B2 bar were found to be 7.12 for color; 6.90 for flavor; 7.07 for appearance; 7.05 for texture; 6.95 for taste and 7.15 for overall acceptability. These values are slightly higher or nearly equal to control bar sample B0.

Statistical analysis – To confirm the differences among the formulation and final acceptance of best passion fruit bar the Analysis of Variance (ANOVA) was carried out. Data obtained from the sensorial analysis were used for the Analysis of Variance (ANOVA), using the statistic software MINITAB 16.0 (trial version). It was found that the p-value less than 0.05 i.e. within significance level were selected as best sample. For passion fruit bar the best samples was found as B2 using ANOVA.

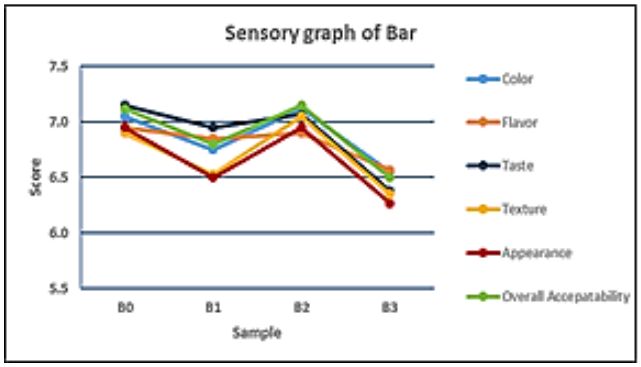
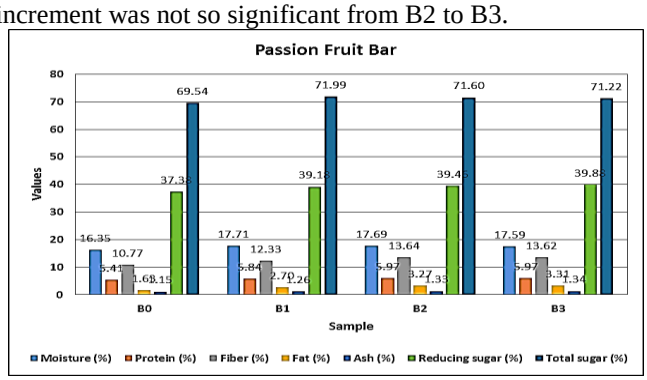


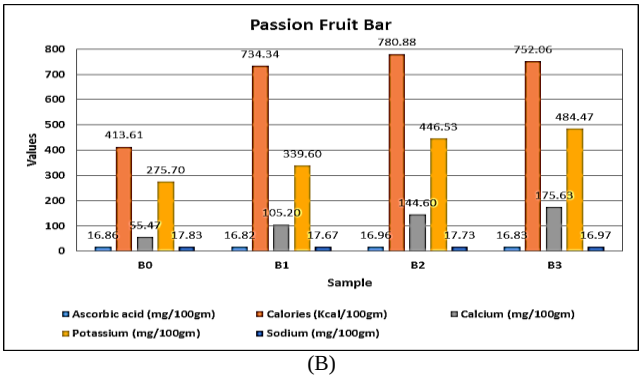
Figure 4: Graph for sensory evaluation of passion fruit-apricot-flaxseed bar

Proximate analysis: The result of proximate analysis were shown in figure 5 (A) and (B). From results, it was found that moisture content increased when honey was used as a sweetener. Due to higher viscosity of honey, it can't be heated upto high level, results in higher moisture content of formulation bars. It is clear from figure that addition of apricot

and flaxseed to passion fruit toffee increases fat, fibre, calories, ascorbic acid and mineral content of the product. The increment was higher from B0 to B1 and B1 to B2, but the increment was not so significant from B2 to B3.



(A)



(B)

Figure 5: (A) and (B) Graph of passion fruit-apricot-flaxseed bar analysis

The best sample B2 was found to have higher values of moisture, fat, fibre, reducing sugar, calories and minerals than the control sample B0, the values are increased from 16.35% to 17.69% for moisture; 1.63% to 3.27% for fat; 5.41% to 5.97% for protein; 10.77% to 13.64% for fibre; 413.61 Kcal/100gm to 780.88Kcal/100gm for energy; 37.38% to 39.46% for reducing sugar; 55.47 mg/100gm to 144.60 mg/100gm for calcium; 275.7 mg/100gm to 446.530 mg/100gm for potassium.

HPLC detection:

Cíntia A. M. Pereira, et. al. 2014 [23] reported the presence of alkaloid Harmane and Harmine in passion fruit pulp and detected by HPLC method. They studied the extraction of alkaloid Harmane and Harmine from the passion fruit pulp and juice and level of reduction by varying the process parameters. The Harmane pick observed at 5.5-6min and Harmine pick at 7.25-7.75min.

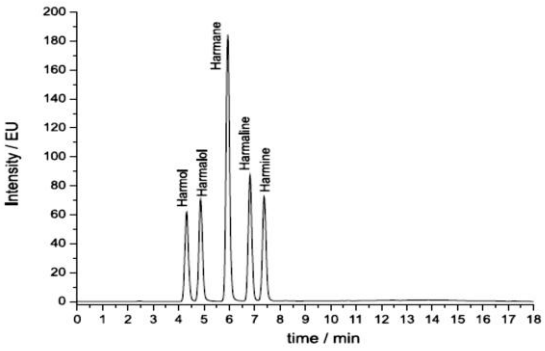
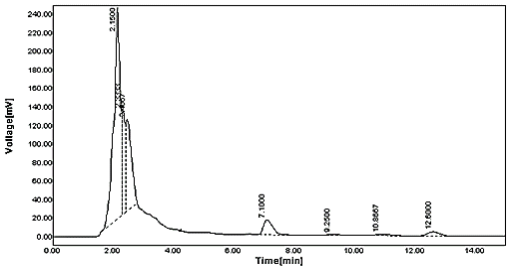
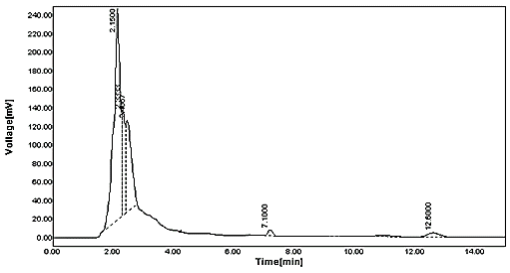


Figure 6: Standard HPLC analysis graph of Harmane and Harmine in passion fruit pulp (adopted from Cíntia A. M. Pereira, et. al. 2014)

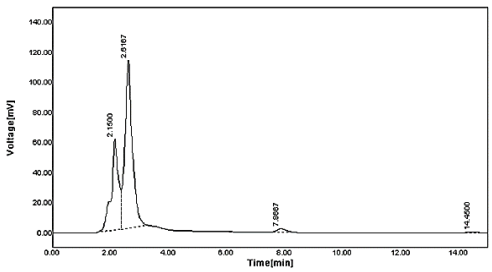
All the product from present study were detected for the alkaloid Harmane and Harmine presence. The samples were analyse over HPLC (Younglin (S.K) Gradient System UV Detector Model no-Acme-9000) equipped with detector UV 730 D and column R.P C18 (cosmosil). The mobile phase used here was same as paper i.e. Water (pH-3.0): Methanol (50:50). The compounds were detected at a wavelength of 254 nm and a flow rate of 0.8ml/min was maintained. Form HPLC analysis (figure 6 and 7) it was clear that Harmane pick was absent and the curve appeared as smooth, while negligible Harmine pick was observed (area ~2% of total HPLC graph). The comparison of Harmine picks (figure 7 (A) to (D)) with standard curve (figure 6) showed that Harmane is absent in prepared passion fruit bars and Harmine was present under safe limit.



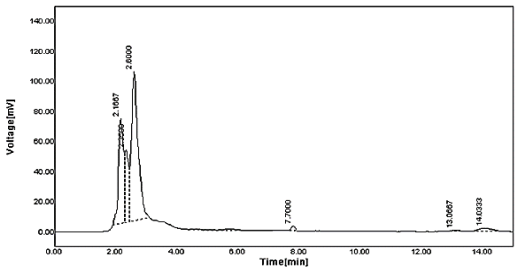
(A)



(B)



(C)



(D)

Figure 7: (A) to (D) HPLC analysis curve of passion fruit bar sample B0 to B3

IV CONCLUSION:

The results of present study conclude that dry apricot pulp and flaxseed powder can be effectively incorporated in the formulation of honey based passion fruit bar to enhance proteins, fibre and mineral contents. Maximum 10% of flaxseed and 10% of apricot pulp were incorporated in passion fruit bar, without significant change in sensory.

B2 bar is reported to be higher in fat (2 B0), calories (1.9 B0), fibre (1.26 B0). The mineral content of B2 bar is also reported to increase, calcium by 160.68% and potassium content by 61.96% more over the control bar. Also B2 contains 39.46% reducing sugar which is 5.5% higher than the control bar.

Consumption of this higher calorie bar may be used for management of malnutrition and under nourished individuals. 100gm consumption of this bar may fulfill 35% fibre, 14% fat, 11% protein, 44% carbohydrate, 40% energy, 14% calcium and 9% potassium of per day RDI requirement. The replacement of sugar by honey in confectionary product reduces the disadvantages like obesity, diabetes, hypertension etc.

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