

Papaya Flavoured Yogurt: Standardization And Sensory Evaluation

Anita Raj*, Preeti Sharma**, Latesh***

*Extension Lecturer in Home Science, Govt. College for Women, Panchkula

**Extension Lecturer in Home Science, Pt. Chiranji Lal Sharma Govt. College, Karnal

***Assistant Professor of Home Science, Govt. PG. College for Women, Panchkula

Corresponding Author: Mrs. Anita Raj

Extension Lecturer in Home Science, Govt. College for Women, Panchkula

Contact: 8437455051

Email: anitagrover7@gmail.com

ABSTRACT

Background: Yoghurt is one of the most unique and a universal dairy product which is not only good in taste but it has many health benefits. It is easily digestible and has high nutritional value. Papaya fruits have a juicy taste rich in antioxidants and nutrients like (Carotene, Vitamin B, flavonoids, folate, pantothenic acids and minerals such as potassium and magnesium, the fruit is also a good source of fibre. **Objective:** The present study deals with the development, standardization and sensory evaluation of papaya fruit yogurt. **Materials and Methods:** Papaya fruit yoghurt was prepared by using a household processing technique by incorporating the same two types of yoghurts (with and without the use of guava pectin & skim milk powder). Standardization, nutritional evaluation and sensory evaluation were conducted for developed papaya fruit yoghurt using the Ranking test, nine-point hedonic test and composite scoring test. **Results:** Sensory evaluation results showed that all the samples of type 1 and type 2 yogurt were palatable. Developed product suggested of good in taste and it has high overall acceptability. But type 2 yogurt sample was found very good for overall acceptability. The shelf life of the product was three days. **Conclusion:** It can be concluded that papaya fruit yogurt type 2 was more acceptable with pleasant organoleptic properties. The product can be prepared by household technique. It gives higher nutritional benefits and improves the digestive system.

Keywords: Organoleptic, Papaya fruit, Yogurt, Antioxidants, Household Technique, Palatable, Standardization

INTRODUCTION

Milk isn't solely nature's food for a new born infant however additionally a supply for a full variety of milk products consumed by mankind (Kamruzzaman et al, 2002). The main carbohydrate present in milk is lactose, which is involved in the intestinal absorption of calcium, magnesium, and phosphorus, and the utilization of vitamin D (Campbell and Marshall, 1975)

Dairy products such as curd, yogurt, cheese, and ice cream have been manufactured by fermentation process to extend the shelf life of milk. Consumption of these fermented dairy products has been associated with decreased risk of osteoporosis, hypertension, colon cancer, obesity, and insulin resistance syndrome (IRS). They are characterized by the accumulation of microbial products such as lactic acid, ethyl alcohol, and flavour substances (Kamruzzaman et al, 2002).

Curd is an Indian fermented milk product known for its refreshing taste, palatability, and therapeutic values. It is a traditional fermented milk product popular in India that contains a mixed culture of lactic acid and *Lactobacillus* (Kerstens et al; 1980). The word da-hi seems to be derived from the Sanskrit word dadhi, one of the five elixirs (panchamirta) often used in Hindi rituals. Curd (Indian Dahi) is popular due to its favourable impact on health and high nutritional value. It has been designated as functional food, which boosts natural as well as acquired immunity and improves stamina (Mackowiak, 2013)

Yogurt, a most popular fermented dairy product which had numerous nutritional and health benefits are well known for centuries. It is obtained from milk and milk products by fermentation with bacteria Lactic acid by the action of *Streptococcus salivarius* subsp. *thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus* (FAO/WHO, 1977, www.dairygoodness.ca/yoghurt/types-of-yoghurt, 2013)

There are many advantages of consuming fermented milk products containing probiotic bacteria. Probiotic organisms' high population in the colon contributes to good intestinal health. As a result, the consumption of products such as yogurt containing viable probiotic organisms' supplements benefits human gut health. Moreover, yogurt supplies good quality proteins, is also an excellent source of calcium, phosphorus, and potassium, and contains significant quantities of general vitamins. It could be used for feeding also. (Demott, 1985).

Yogurt is also known as an excellent source of protein, calcium, phosphorus, riboflavin (vitamin B2), thiamine (vitamin B12), and a valuable source of folic acid, niacin, magnesium, and zinc. It provides protein of high biological value, and also vitamins and minerals present in milk and milk foods including yogurt are bio available. (Katz, 2005).

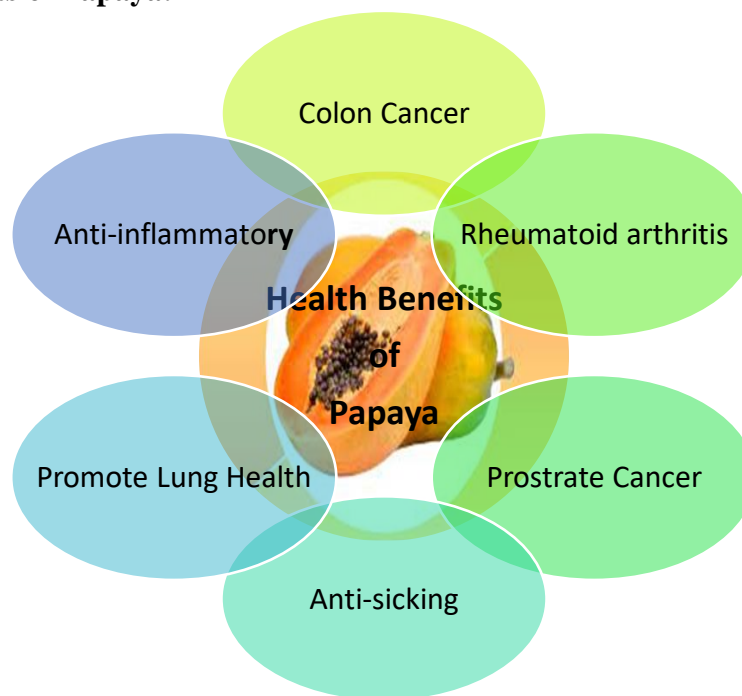
Human consumption of yoghurts has been associated with tremendous health benefits due to improvement of gastrointestinal functions and disease risk reduction (Heyman, 2000). These health benefits include longevity (Metchnikoff, 1908), improved lactose digestion and elimination of lactose intolerance symptoms among maldigestion (Vesa et al, 1996), lowered cholesterol level, and reduction in the risk of hypertension (Taylor and Williams, 1998; Takano 1998), lowered cancer tendency (Veer et al, 1989), diarrhoea prevention and control as well as maintenance of gastrointestinal micro flora (Boudraa et al .1990).

Fruits are considered good source of minerals and vitamins. Their water content is high, ranging between 80 to 90%. The polysaccharides cellulose, hemicelluloses and peptic substances are the structural components of fruits. These fruits make important sources of roughage or bulk in diet (Manay and Shadaksharaswamy, 2008). Fruits are highly perishable in nature and require immediate processing hence supplementation of yogurt with fruits will not improve its flavour but also overall nutritional quality (Patil et al, 2009).

In historic times, papaya was considered an exotic fruit because of its buttery taste and appearance (Bhowmik, 2013). Papaya is called a powerhouse of nutrients. It is available throughout the year. Papaya belongs to the family Caricaceae which is commonly known as papaya in English, Papita in Hindi, and Erandakarkati in Sanskrit. It is a rich source of three powerful antioxidant vitamins (C A & E); the minerals (magnesium and potassium) the B vitamin pantothenic acid and folate and fibre (Milind, 2011)

It is no wonder the papaya was reputedly called the “fruit of the angels” by Christopher Columbus (www.whfoods, 2010). Papaya is a rich source of vitamins particularly vitamin A. Ripe fruits contain 7-9% sugars and are valued as breakfast fruit, usually with added sugar and lime juice. Preserves of various kinds and marmalades are made from ripe fruits (Manay and Shadaksharaswamy, 2004). It is also utilized for salads, sherbets, and confections.

Health Benefits of Papaya:



1. Colon cancer- The fibre of papaya is able to bind cancer-causing toxins in the colon and keep them away from the healthy colon cells. These nutrients in papaya give synergistic protection for colon cells from free radical damage to their DNA.
2. Anti-Inflammatory effects- Protein enzymes including papain and chymopapain and antioxidant nutrients found in papaya; including vitamin C, vitamins E, and beta-carotene, reduce the severity of the conditions such as asthma, osteoarthritis, and rheumatoid arthritis.
3. Rheumatoid arthritis- papaya, provide humans with protection against inflammatory polyarthritis, a form of rheumatoid arthritis involving two or more joints.
4. Promote lung health- papaya, help your lung health and save your life.
5. Anti-sickling property- Current research proves that papaya is having an anti-sickling property.
6. Prevent prostate cancer- Men consuming lycopene rich fruits and vegetables such as papaya, tomatoes, apricots, pink grapefruit, watermelon, and guava were 82 % less likely to have prostate cancer compared to those consuming the least lycopene rich fruits and vegetables. (Ordonez, 2006)

Materials and Methods

The aim of the present study was to evolve and standardize Papaya fruit yoghurt by household techniques. The main aim of product development is to fulfill the nutritional requirements of the community within the limitations of time, energy, and money available. Following steps were undertaken to formulate and standardize Papaya fruit yoghurt.

1. Formulation and standardization of papaya yoghurt

1.1 Stage of innovation

The various ideas and techniques of yogurt preparation were recorded and screened. The stage led to taking up various trials to prepare papaya fruit yogurt. The possibilities to be explored were: -

- Percentage of addition of papaya in milk.
- Proportion of papaya to be added.
- Form in which papaya was to be added (pulp and pieces).
- Percentage of sugar to be added; before % after curdling.
- Household methods of yogurt texture improvement.

1.2 Prototype development

Nearly eight methods of fruit yogurt preparation were recorded as a consequence of step 3.1.1.1. Prototype development was carried out for the promising methods. Papaya yogurt samples were prepared with 15% sugar and 10% and 20% fruit shared or pulp levels. Sugar was added in four samples of fruit yogurt before (B) culture inoculation and in four samples

after (A) inoculation. After mixing sugar and fruit at different levels in milk (toned milk, 3 % fat, “Saras”), Sara’s curd was added as a starter culture at a 5 % level in it. Then milk samples were incubated at 30° C for four incubators.

Table 1: Papaya yoghurt (type 1)

Samples	Fruit (piece/ pulp)	Milk (ml)	Starter Culture	Sugar (Before/ After)
A1	10% Shred	50	5 %	15 % (B)
B1	10% Shred	50	5 %	15 % (A)
C1	20% Shred	50	5 %	15 % (B)
D1	20% Shred	50	5 %	15 % (A)
E1	10% Pulp	50	5 %	15 % (B)
F1	10% Pulp	50	5 %	15 % (A)
G1	20% Pulp	50	5 %	15 % (B)
H1	20% Pulp	50	5 %	15 % (A)

2. Sensory Evaluation

To assess the acceptability and judge the quality of the product- an organoleptic or sensory evaluation was conducted. Sensory evaluation was conducted by consumer panels and trained assessors’ comment on the appearance, color, texture, taste, and flavor of the product being developed by using the Ranking test, nine-point hedonic rating scale, and a composite scoring test.

2.1 Sensory evaluation by panelists

The 15 judges selected by the triangle test evaluated the test products. The evaluation was done using:

- Ranking Test
- Nine points hedonic rating scale
- Composite scoring test

2.2. Sensory evaluation was conducted in a library, free of noise and odor during mid-morning between 10 and 11 am, as this is considered the best timing for testing. To be measured were color, flavor, and appearance after taste and consistency, and mouth feel. Each of these attributes was to be rated on 5-point scale with 5 considered as “excellent” and 1 considered as “poor”.

1. The samples were introduced one at a time to each of the panel members and water was provided after testing each sample.

2. It was a quiet area, free from any disturbance.
3. Natural light source was used during the test as it would not influence the appearance of the product to be tested.

Result and Discussion

Papaya fruit yogurt was developed by using different concentrations of sugar and fruit (shred and pieces) and formulation and standardization of food products incorporated with papaya yogurt to appraise their sensory and nutritional quality. The Preliminary phase of the study involves standardizing the concentration of fruit and sugar for preparing fruit yogurt using household processing techniques. The preparation, standardization, and organoleptic acceptability of Papaya fruit yogurt by household processing technique were found to be highly acceptable and papaya fruit yogurt was found to be very good in overall acceptability.

Sensory evaluation of fruit yogurt

Sensory evaluation was conducted by using the ranking test, nine-point hedonic test, and composite rating test which were assessed by a semi-trained panel of 15 judges who were selected by the triangle difference test

- **Ranking Test**

This test was used to determine how several samples differ on the basis of a single characteristic. Control need not be identified. Panelists presented all samples simultaneously with a code number and were asked to rank all samples according to the intensity of the specified characteristics. By conducting a ranking test 3 samples (A1 (10% shred), C1 (20% shred), and E1 (10% pulp) of type 1 fruit yogurt were selected which has been shown in (table 4.1) as well as A2, C2, and E2 of type 2 fruit yogurt were also selected, which has been shown in (table 2).

Table 2: The ranking test of papaya fruit yogurt (Type 1)

Products	Total Scores	Total Ranks
A1	22	I
B1	74	V
C1	24	II
D1	84	VI
E1	45	III
F1	89	VII
G1	71	IV
H1	98	VIII

Table 3: The ranking test of papaya fruit yogurt (Type 2)

Products	Total Scores	Total Ranks
A2	24	I
B2	69	IV
C2	38	II
D2	79	VI
E2	42	III
F2	84	VII
G2	92	VIII
H2	74	V

- **Hedonic rating test**

Nine points hedonic scale was used by panelists to assess and evaluate the overall acceptability of the product. The data is illustrated in the bar diagram in fig and. Among the eight types 1yoghurt sample A1 obtained the highest mean score whereas sample A2 had the highest mean in type 2 set yogurts. Since the addition of guava pulp (for its pectin content) and skimmed milk powder enhanced the textural properties of type 2 papaya yogurt had better likeability in comparison to type 1. Addition of papaya in the form of shred resulted in higher acceptability as reflected by the hedonic test.

- **Composite scoring test**

In these five characteristics to be measured, viz.; color, flavor, appearance, after taste, consistency, and mouth feel. Each of these attributes was to be rated on 5-point scale ranging from “excellent” (5) to “poor” (1). Mean was used to measure the central tendency while SD was computed to assess the dispersion.

Table 4: Composite rating scores for different attributes of papaya yogurt (Type 1)

Products	Color	Flavor	Appearance	After taste	Consistency and Mouth feel
Mean ±SD					
A1	4.3 ± 0.72	4.1 ⁺ .0.79	4.6 ⁺ .0.52	4.6 ⁺ .0.48	4.5 ⁺ .0.52
B1	2.9 ± 0.59	2.9 ⁺ .0.70	2.4 ⁺ .0.73	2.2 ⁺ .0.56	2.4 ⁺ .0.53
C1	4.2±0.70	4.0 ⁺ .0.74	4.1 ⁺ .062	4.2 ⁺ .0.56	4.2 ⁺ .0.73

D1	3.0 [±] 0.74	2.3 ⁺ 0.61	2.4 ⁺ 0.51	2.3 ⁺ 0.59	2.3 ⁺ 0.52
E1	4.1 [±] 0.76	4.1 ⁺ 0.71	4.0 ⁺ 0.74	4.1 ⁺ 0.62	4.2 ⁺ 0.58
F1	3.4 [±] 0.51	2.8 ⁺ 0.74	2.2 ⁺ 0.56	1.8 ⁺ 0.63	2.1 ⁺ 0.64
G1	2.9 [±] 0.70	2.4 ⁺ 0.51	3.4 ⁺ 0.63	3.1 ⁺ 0.63	3.4 ⁺ 0.31
H1	2.8 [±] 0.63	3.0 ⁺ 0.79	1.7 ⁺ 0.89	1.9 ⁺ 0.70	1.7 ⁺ 0.70

Table 5: Composite rating scores for different attributes of papaya yogurt (Type 1)

Products	Color	Flavor	Appearance	After taste	Consistency & Mouth feel
Mean [±] SD					
A2	4.4 ⁺ 0.74	4.2 ⁺ 0.67	4.4 ⁺ 0.76	4.2 ⁺ 0.70	4.6 ⁺ 0.66
B2	2.9 ⁺ 0.59	3.0 ⁺ 0.62	2.7 ⁺ 0.63	3.0 ⁺ 0.74	2.7 ⁺ 1.22
C2	4.3 ⁺ 0.72	4.1 ⁺ 0.72	4.2 ⁺ 0.79	4.0 ⁺ 0.75	4.2 ⁺ 0.83
D2	2.6 ⁺ 0.74	2.4 ⁺ 0.62	2.2 ⁺ 0.88	2.2 ⁺ 0.52	2.4 ⁺ 0.74
E2	4.0 ⁺ 0.79	4.0 ⁺ 0.82	4.3 ⁺ 0.63	4.1 ⁺ 0.73	4.2 ⁺ 0.72
F2	3.2 ⁺ 0.52	2.4 ⁺ 0.51	2.7 ⁺ 0.56	2.8 ⁺ 0.70	1.8 ⁺ 0.83
G2	2.5 ⁺ 0.56	2.4 ⁺ 0.62	2.2 ⁺ 0.88	2.5 ⁺ 0.56	1.7 ⁺ 0.79
H2	3.4 ⁺ 0.51	3.2 ⁺ 0.52	2.9 ⁺ 0.59	2.4 ⁺ 0.91	1.8 ⁺ 0.91

Papaya fruit yogurt sample (Type 1)

Color

The five-point composite scoring test presented in table 5 clearly indicates that in colour, there was a slight difference between samples A1, C1, and E1. The colour of sample A1 was found to be very good with a mean of 4.3. comparatively C1 was found to be good with a mean of 4.2. The mean value of E1 was 4.1 which was also good and accepted by judges.

Flavour

Five-point composite scoring test in table 5 clearly indicated that the Flavour of papaya fruit at lower levels (A1, E1) was more acceptable with a mean of 4.1 and 4.0 respectively.

Appearance

There was highly difference between samples A1, C1, and E1. A1 sample scored highly by panel members with a higher mean value of 4.6 C1 and E1 have less acceptability in comparison to A1 and their mean values are 4.1 and 4.0 respectively.

After taste

Taste was to be very good of sample A1 with a mean of 4.6 while C1 and E1 were found to be good and accepted by the judges with a mean of 4.2 and 4.1 respectively.

Consistency and mouth feel

The Texture of sample A1 was smooth with an easily flowing consistency and has a good mouth feel. The acceptance of sample A1 was found to be very good having a mean of 4.5 comparatively C1 and E1 have low acceptability with a mean of 4.2.

Papaya fruit yogurt sample (Type 2)

Colour

The five-point composite scoring test presented in table 4.6 clearly indicated that in color, there was a slight difference between samples A2, C2, and E2. The color of sample A2 was found to be very good with a mean of 4.4. Comparatively, C2 was found to be good with a mean of 4.3. The mean value of E2 was 4.0 which was also good and accepted by judges.

Flavour

The flavours of papaya fruit at a lower level (A2, E2) were more acceptable with a mean value of 4.2 and 4.1 respectively in comparison to sample C1.

Appearance

A2 sample scored highly by panel members and its mean value is 4.4. C2 and E2 have less acceptability in comparison to A2 with a mean value of 4.2 and 4.3 respectively.

After taste

After taste was found to be very good for sample A2 with a mean of 4.2 while C2 and E2 were found to be good and accepted by the judges with a mean of 4.0 and 4.1 respectively.

Consistency and mouth feel

The texture of sample A2 was smooth with an easily flowing consistency and has a good mouth feel. The acceptance of sample A2 was found to be very good having a mean of 4.6. C2 and E2 are slightly different from A2 with a mean of 4.2.

Table 6: Composite rating score of selected papaya yogurt (type 1)

Products	Colour	Flavour	Appearance	After taste	Consistency and Mouth feel
Mean \pm SD					
A1	4.3 ⁺ .0.72	4.1 ⁺ .0.79	4.6 ⁺ .0.52	4.6 ⁺ .0.48	4.5 ⁺ .0.52
C1	4.2 ⁺ .0.70	4.0 ⁺ .0.74	4.2 ⁺ .0.62	4.2 ⁺ .0.56	4.2 ⁺ .0.73
E1	4.1 ⁺ .0.76	4.1 ⁺ .0.71	4.1 ⁺ .0.74	4.1 ⁺ .0.62	4.2 ⁺ .0.58

Table 7: Composite rating score of selected papaya yogurt (type 2)

Products	Colour	Flavour	Appearance	After taste	Consistency and Mouth feel
Mean \pm SD					
A2	4.4 ⁺ .0.74	4.2 ⁺ .0.67	4.4 ⁺ .0.76	4.2 ⁺ .0.70	4.6 ⁺ .0.66
C2	4.3 ⁺ .0.72	4.1 ⁺ .0.72	4.2 ⁺ .0.79	4.0 ⁺ .0.75	4.2 ⁺ .0.83
E2	4.0 ⁺ .0.79	4.0 ⁺ .0.82	4.3 ⁺ .0.63	4.1 ⁺ .0.73	4.2 ⁺ .0.72

CONCLUSION

The present study was conducted to standardize and conduct an Organoleptic Evaluation of Papaya fruit yogurt which was developed by using different concentrations of fruit and sugar through household processing techniques. Total 8 samples were prepared, out of which 3 samples were selected from papaya yogurt type 1 and type 2 on the basis of using the ranking test, hedonic, test and composite scoring test with the help of fifteen semi-trained panel members. After standardizing recipes sensory evaluation was done to the acceptability and then nutrient calculation was done to know the estimation of nutrients contained in the product. Out of eight samples (A1, B1, C1, D1, E1, F1, G1, and H1), three samples A1, C1, E1 were selected with the highest rank of 1st, 2nd, 3rd respectively for papaya yogurt type 1. For papaya yogurt type 2, on the basis of ranking tests A2, C2, and E2 samples were selected with the highest rank of 1st, 2nd, and 3rd respectively. It can be concluded that Papaya fruit yogurt type 2 was found excellent in overall acceptability (color, texture, mouth feel, taste, appearance, etc.). The shelf life of the product was three days. The development of Papaya fruit yogurt gives higher nutritional benefits along with its good taste. It can be suggested for optimizing the immune system and improving the digestion system as yogurt is an excellent source of protein, calcium, phosphorus, thiamin,

riboflavin, , vitamin B₁₂, and a relevant source of folate , magnesium, zinc and niacin. It has been reported to treat diarrhea, infant allergies, hyperlipidemia, helicobacter pylori infections, etc. The addition of fruit (papaya, guava) to milk does not only enhance the taste of the yogurt itself but also added to the therapeutic value of milk products.

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