International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

Devlopment and Evalution of Sweet Yogurt Incorporated with Fruit Pulp (Pineapple)

Arun Sharma
Msc Food Technology 4SEM
Roll No. 117209660018
Shri Dev Suman University,
Uttarakhand

Under Supervision of
Dr. Rattan Singh
Baba Farid Institute of Technology
Sudhowala, Dehradrun, Uttrakhand

CHAPTER - 1 INTRODUCTION

Yogurt is one of the most popular fermented milk products having different names and forms (Tamime and Robinson 2007). Human consumption of yoghurt has been associated with tremendous health benefits due to improvement of gastrointestinal functions and disease risk reduction (Heyman, 2000). Like milk, yoghurt is a healthy and delicious food due to its high nutritive and therapeutic value (Perdigon*et al*., 2002).Yoghurt is a custard like semi solid, acidified dairy product made by fermenting partially evaporated milk with a special culture containing lactic acid producing bacteria (Munzur*et al*., 2004). The bacteria used to make sweet yogurt are known as "yogurt cultures". It is obtained by lactic acid fermentation of milk through the action of a starter culture containing Streptococcus *thermophilus* and Lactobacillus *bulgaricus* (Adolfsson *et al*., 2004). Fermentation of lactose by these bacteria produces lactic acid, which acts on milk protein that coagulates and set to give yogurt its texture and its characteristic flavour. A colourless liquid called acetaldehyde is also produced during fermentation and gives yogurt its distinct flavour (Kumar & Mishra, 2004).

Yoghurt improves the immune system, decreases cancer, prevent diarrhoea, help in absorptions of iron, protein and calcium [9]. Yoghurt lowers the blood cholesterol level and imparts many other health benefits owing to the presence of protein. Yoghurt strengthens the abdomen and provides assistance to the nervous system and decreases bowel cancer and inflammation effectively due to the availability of vitamins. Yoghurt also helps to reduce various disorders such as intestinal illnesses. Yoghurt promotes gut and vaginal fitness by providing probiotics (beneficial bacteria) [10]. Regular consumption of yoghurt suppressed the pathogenic bacteria like Helicobacter pylori which cause stomach ulcers [11]. The culturing organisms in yoghurt convert lactose into lactic acid that is easily digestible by lactose-intolerant persons. Fruits contain a large number of minerals, vitamins, sugar content, dietary fibre and a smaller amount of fat content.

Pineapple (Ananas comosus) belongs to the family Bromeliaceae, is a tropical fruit grown in the tropical and sub-tropical regions. It is grown on large scale in India and now India is the second largest producer of fruits after Brazil. The Pineapple producing countries are Philippines, Thailand, China, Brazil, India, Mexico and South Africa.India is the fifth largest producer of pineapple with an annual output of about 1.2 million tonnes (Baruwa, 2013) Pineapple fruits exhibit high moisture, high sugars, soluble solid content ascorbic acid and low crude fiber. Pineapple can be used as supplementary nutritional fruit for good personal health. The pineapple fruits are normally consumed fresh or as fresh pineapple juice. Field ripe fruits are best for eating fresh, and it is only necessary to remove the crown, rind, eyes and core. Pineapple may be consumed fresh, canned, juiced, and are found in a wide array of food stuffs - dessert, fruit salad, jam, yogurt, ice cream, candy, and as a complement to meat dishes.

Pineapple is important source of carbohydrates, sugar, organic acid, vitamins, crude fiber and minerals. Bromelain enzyme acts as a natural detox that is good for digestive system and helps to maintain ideal weight and balanced nutrition (Hossain and Shaheen, 2015). Pineapple contains total lipid (0.19%), total carbohydrate (18.6%) water (80.3%), protein (0.58%) and several minerals such as copper, magnesium, manganese zinc and iron. Total dietary fibre is 1.48% and ascorbic acid comprises 7.5mg. Pineapple contains a high amount of sugar 12.5 g/100 g than other highly consume fruit such as apple, peach, pear and orange. Pineapple fruit has several health benefits against diabetes, blood pressure, diuretics, cough, and a variety of viral and bacterial transmittable diseases, including dental caries. The beneficial properties of Pineapple are due to the availability of several

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

bioactive compounds like carotenoid and polyphenol which play a vital role in anticipation of degenerative diseases. Pineapple fruit furthermore utilizes in the development of numerous products because of its functional characteristics (Farid *et al*., 2015).

Now-a-days, the demand for dairy product is increasing and gaining momentum in India as well as in other countries due to increasing trend towards fast foods and also to cater the changing consumer taste. As many people consider yogurt as healthy and nutritional food and thus also contains more nutritional value than dahi. Yogurt incorporated with fruit pulp makes the yogurt tastier. Keeping this in view, the present project work has been planned with the following objectives:

1. To standardize appropriate combination of yogurt & pineapple pulp.
2. To evaluate storage quality of the product.

CHAPTER - 2 REVIEW OF LITERATURE

Attempts have been made to review, collect and update literature on the research topic Development and evolution of value added sweet yogurt incorporated with fruit pulp (pineapple)". The literature relevant to the present investigation has been reviewed in this chapter under the following headings:

2.1 Physico-chemical characteristics of pineapple fruits

2.2 Preparation of product

2.3 Utilization of fruit/fruit pulp in dairy based food products

2.4 Changes in physico-chemical constituents of food product during storage

2.5 Changes in sensory quality of food product during storage

2.6 Changes in microbial quality of food product during storage

2.1 Physico-chemical characteristics of pineapple fruits

pH of pineapple peel, core and crown extracts were determined at room temperature using pH meter after being standardized with pH 4 and pH 7 buffers**.** Total titratable acidity of pineapple pulp was determined by titration method following Amador (2008). Total soluble solid (TSS) of pineapple peel, core and crown extracts were determined using an refractrometer. The percentage of TSS was obtained from direct reading of the refractrometer.

The moisture content of pulp of the pineapple exhibited opposite trends during development. An increasing trend was observed in the pulp of the pineapple of the fruit. A increase of up to 5.5% was observed in the pulp as the pineapple developed. This phenomenon may have been caused by changes in the osmotic pressure of the fruit. Water has the tendency of moving from the peel to the pulp (Asiedu, 1987).

Fat content is one of the most important quality factors of yogurt or fruit yogurt. It depends on milk quality, amount of fruit pulp, fruit variety and other treatmen Result showed that, maximum (3.75%) and minimum (3.50%) fat content were found in control and 15 days pulp yogurt sample respectively. Highest fat (3.69%) was found in (0) day sample among fruit yogurt samples. Fat content in fruit yogurt decreased gradually with the increase of pulp content because of very low amount of fat content in pulps compared to milk.

It was observed that change in protein content in yogurt samples was greatly influenced by incorporation of fruit pulps. Protein content in yogurt samples decreased with the increase of pulp content. The highest (3.80%) and lowest (3.71%) protein were found in control and 15 days sample respectively. (0) days sample was found with highest protein content (3.78%) among fruit yogurts. Low protein content in fruit pulp than raw milk might be major cause of low protein content in high fruit pulp incorporated yogurt.

2.2 Preparation of product

Preparation of fruit yoghurt has been investigated by a number of researchers in different parts of world. But, in India no research work has yet been done on the manufacture of yoghurt incorporating pineapple

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

Hence in the present study, an attempt was made to develop a suitable technology for the production of fruit pulp made yoghurt from buffalo milk fortified with different levels of pineapple pulp to compare their qualities on the basis of physical, chemical and microbiological parameters.

2.3 Utilization of fruit/fruit pulp in dairy based food products

Caili et al., 2006b Fruit pulp and the seed of pumpkin have exhibited antidiabetic activity in animal studies including alloxan-induced diabetic rabbits and rats. Powders from pumpkin significantly decreased blood glucose whilst increasing plasma insulin in the blood One study employing type 2 diabetic Wistar rats accounted for the antidiabetic property of pumpkin for the tocopherols in the seed composition of *C. pepo*, and concluded that the seed tocopherols reduced prediabetics to progress into diabetics (Bharti et al., 2013). PSO from *C. pepo* and *C. maxima* has also alleviated urinary disorders during oral administration of a human study (Nishimura et al., 2014). Sedimentation during storage due to denaturation of whey proteins on heating is one of the prominent defects in these beverages. This sedimentation defect can be diminished by adjusting the pH (around 3.6) of the beverage before heating treatment. At even this low pH, some sedimentation is observed which is related to the interaction between whey proteins and pectin from fruit pulp or juice. This can be prevented by using fruit sources having very low amount of pectins or via enzyme treatment of fruit juice before blending with whey.

2.4 Changes in physico-chemical constituents of food product during storage

(Espert et al 2020)Processing food is necessary to extend product shelf life. This includes a wide range of processing operations such as dehydration, thermal treatment, encapsulation, and extrusion. All processing operations lead to changes in physicochemical properties and the structure of the food, which can be desirable or undesirable. The physicochemical properties of food are mainly responsible for the final quality of the product. Moreover, the measurement of these properties is important for design and quality control during the processing of the food.

Physicochemical and structural changes in food during processing depend on the food's stage (solid or fluid) and its constituents. Although there are numerous physicochemical properties of food, the appropriate property depends on the kind of food and the aim of the chosen assay. This includes, for example, hydration food properties (water activity, water absorption capacity, water retention capacity, hygroscopicity, dispersibility, solubility, etc.), rheological fluid behavior, mechanical properties, optical properties (colour, translucence, etc.), and thermal food properties.

Physical and chemical changes in each constituent and ingredient results from processing operations and often leads to physical, sensory, and nutritional changes in the food and, therefore, in the quality. There are numerous physicochemical properties of food, for example, hydration properties (water activity, water absorption capacity, water retention capacity, hygroscopicity, dispersibility, solubility, etc.), rheological fluid behavior, mechanical properties, optical properties (color, translucence, etc.), and thermal This Special Issue is dedicated toward the understanding of the physicochemical properties and structure changes of food products during processing. Processing food is necessary to not only extend product shelf life but also lead to changes in the physicochemical properties and structure of foods, which can be desirable or undesirable. Processing operations include dehydration, thermal treatment, encapsulation, and extrusion. The physicochemical properties of food are mainly responsible for the final quality of the product. Moreover, the measurement of these properties is important for design and quality control during the processing of the food.

2.5 Changes in sensory quality of food product during storage

Waldron et al., (2003) natural pigments in fruits and vegetables, many of which change as the plant proceeds through maturation and ripening. The primary pigments imparting color quality are the fat soluble chlorophylls (green) and carotenoids (yellow, orange, and red) and the water soluble anthocyanins (red, blue), flavonoids (yellow), and betalains (red). In addition, enzymatic and non-enzymatic browning reactions may result in the formation of water soluble brown, gray, and black colored pigments. The enzymes involved in browning reactions include polyphenol oxidase, which catalyzes the oxidation of polyphenolic compounds, and phenylalanine ammonia lyase, which catalyzes the synthesis of precursors to phenolic substrates. The chlorophylls are sensitive to heat and acid, but stable to alkali whereas their counterpart carotenoids are sensitive to light and oxidation but relatively stable to heat. Carotenoids may be bleached by an enzyme called lipoxygenase, which catalyzes the oxidation of lipid compounds. Anthocyanins are sensitive to both pH and heat, while the flavonoids are sensitive to oxidation but relatively stable to heat. Betalains are heat sensitive as well (Clydesdale and Francis, 1976). Appearance is determined by physical factors including the size, the shape, the wholeness, the presence of defects (blemishes, bruises, spots, etc.), finish or gloss, and consistency. Size and shape may be influenced by cultivar, maturity, production inputs, and the growing environment. It is important for fruits and

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

vegetables to be of uniform size and characteristic shape (Mitcham et al., 1996). Some consumers associate larger size with higher quality. The wholeness and absence of defects will be affected by exposure to disease and insects during the growing period and the harvest and postharvest handling operations. Mechanical harvesting, for example, may incur more bruises and cracks in fruits and vegetables than hand harvesting. Fruit and vegetable gloss are related to the ability of a surface to reflect light and freshly harvested products are often more glossy (Mitcham et al., 1996). Gloss is affected by moisture content, wax deposition on the surface, and handling practices postharvest. Consistency or smoothness may be used as an appearance term, but is typically applied to semi-solid products, where it indicates the product thickness.

2.6 Changes in microbial quality of food product during storage

(Jeonju-si, Korea) Two commercial dried persimmon samples (dried persimmon-1 and dried persimmon-2) produced by different drying methods from different manufacturers were provided from Korea Food Research Institute. Dried persimmon-1 and dried persimmon-2 were manufactured by vacuum drying and hot-cool air drying, respectively. Dried persimmon-1 (105 g) and dried persimmon-2 (200 g) were provided with complete sealing of the packaging film (polyethylene) and closed plastic box (polyethylene terephthalate), respectively, and both products were packaged in sliced pieces. When the weight of the packaging unit (a pack or box) of both products were measured, the actual weights (g) of dried persimmon-1 and dried persimmon-2 packaging units were 105.47 ± 2.64 and 201.70 ± 0.06 g, respectively (data not shown). For each measurement experiment, 22 packaging units of both products were stored in an incubator (SJ-503H, Sejong Scientific Co., Bucheon-si, Korea) at −20, 5, 12, and 25°C and analyzed for microbiological and physicochemical changes at 7-day intervals for 70 days. These temperatures were chosen based on the recommended storage temperature (−20°C) for dry persimmon, and high temperatures (5, 12, and 25°C) were chosen for accelerated testing. After storage for a certain period of time at each temperature, 10, 15, 20, and 25 g samples from a single packaging unit were measured and used for the measurement of microbial count, moisture content, color, and texture, respectively. Each experiment was duplicated using two packaging units for both products by each storage time. Dried food products could be contaminated with pathogenic bacteria through a wide variety of channels during manufacturing, storage, transportation, and distribution because of improper storage conditions including storage temperature, RH, and packaging methods (Shin, Hwang, &Youn, 2003; Youn, 2004). A number of studies have reported that dried foods and food ingredients were contaminated with pathogenic bacteria such as Cronobacter sp. (Norberg et al., 2012), Escherichia coli O157:H7 (Deng, Ryu, &Beuchat, 1998; Glass, Loeffelholz, Ford, & Doyle, 1992), and Salmonella sp (Archer, Jervis, Bird, & Gaze, 1998; Beuchat& Mann, 2011). Particularly, pathogenic spore-forming bacteria and molds have been identified as significant hazards in dried foods. Spores of Bacillus cereus and Clostridium perfringens have been detected in dried foods such as rice cereal (Jaquette&Beuchat, 1998), spices (Beuchat et al., 2013), and foods stored for long periods, and they can germinate and grow in reconstituted products that are not properly processed or stored. Moreover, molds capable of producing aflatoxin, ochratoxin, and other mycotoxins have been detected in dried foods such as rice, spices, dried fruits, and flour (Cousin, Riley, &Pestka, 2005; Shinha&Bhatnager, 1998)

CHAPTER 3 - MATERIALS AND METHODS

The present research work entitled, "**DEVLOPMENT AND EVALUTION OF SWEET YOGURT INCORPORATED WITH FRUIT PULP (PINEAPPLE)**" was carried out in BFIT Groups of Institutions, Dehradun during the year 2022. The research work was undertaken as per details given below:

3.1 Procurement of materials

The following materials were collected for undertaking the present study.

3.1.1 Raw materials and ingredients

Good quality pineapple fruits and milk were procured from local orchard/market, Dehradun.

3.1.2 Chemicals

The chemicals used in the present investigation were analytical grade reagents from standard suppliers.

3.2 Collection and storage of pineapple pulp

Fully ripened pineapple fruits are washed and the skin, core and eyes are removed manually. Then it is chopped into small pieces and blended to obtain a homogeneous pulp. There is a requirement to give heat treatment to raw pineapple pulp because raw pineapple pulp contains a proteolytic enzyme called '*Bromelian*' which hydrolyses milk protein and produces bitter peptides. (Fig.3.1). Sodium benzoate @ 1g/kg pulp was dissolved in a little water and mixed with the pulp. The pulp was then packed in polypropylene jars and stored in deep freezer to develop and evaluate value added yoghurt variants.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

Ripe pineapple fruit

↓

Washing and cutting into thin slices

↓

Passing through blender

↓

Pineapple pulp

↓

Mixing of sodium benzoate

(1g/kg pulp)

↓

Packing in polypropylene jars

↓

Storing in deep freezer (-20°C)

Fig. 3.2 Flow sheet for collection and storage of pineapple pulp

3.3 Preparation of value added sweet yoghurt using pineapple pulp

Pasteurized milk is heated till its volume reduces to 1/3rd of its original volume. Then milk is allowed to cool down to about 40C. After that 2% of yoghurt (purchased from local Dehradun market, manufactured by a reputed dairy production industry in Uttrakhand) is being mixed thoroughly to the milk as a starter culture. One sample is taken as control and other samples are mixed with the pineapple fruit pulp in the various combinations (100:0, 95:05, 90:10 and 85:15) as per standard procedure (Fig. 3). One kg yoghurt/yoghurt with blended pulp, 15g of powder sugar were used for preparation of value added sweet yoghurt variants. On the basis of sensory evaluation, sweet yoghurt using 10% pineapple pulp (90:10) was selected for development and comparative evaluation of value added sweet yoghurt during storage was standardized for preparation and evaluation of value added sweet yoghurt incorporated with pineapple pulp (90:10). The final products were evaluated for changes in chemical constituents and sensory quality at 0, 5 and 10 days of interval during 15 days of storage.

Yoghurt

↓

Mixing powder sugar

(as per recipes for variants)

↓

Stirring and mixing

↓

Cooling and setting

↓

Packing in PET bottles

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

↓

Storing at low temperature

Fig. 3.3 Flow sheet for preparation of value added sweet yoghurt using pineapple pulp

3.6 Physico-chemical analysis

Pineapple fruit, its pulp, milk and processed product *i.e.*, spiced yoghurt with the incorporation of pineapple pulp were analyzed for the following physico-chemical parameters. The product was also evaluated for sensory quality using 9-point hedonic scale at 0, 5 and 10 days interval during 15 days storage.

(a) Analysis of pineapple pulp

1. Fruit weight (g)
2. Pulp weight (g)
3. Yield of pulp (%)
4. Total soluble solids (%)
5. pH (%)
6. Acidity (%)
7. Moisture content (%)
8. Protein content (%)
9. Fat content (%)
10. Ash content (%)

(b) Analysis of Raw Milk

1. Moisture content (%)
2. Ash content (g)
3. Protein content (%)
4. Total soluble solids (%)
5. Fat content (%)
6. Acidity (%)
7. PH

(C) Final product

Total soluble solids (%)

p.H (%)

Acidity (%)

Moisture content (%)

Protein content (%)

Fat content (%)

Ash content (%)

Sensory evolution

Yeast& mold count

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

Cost of production

3.6.1 Fruit weight (g)

The weight of pineapple fruits was taken using electronic balance and average weight per fruit was calculated and expressed in grams.

3.6.2 Pulp weight (g/kg)

Initial weight of selected fruits was recorded. Pineapple fruits were peeled off. The excluded material was weighed on top pan electronic balance. Pulp weight was calculated by the following formula:
Pulp weight of pineapple (g) = [Initial weight of fruit (g)-weight of peel (g)]

3.6.3 Yield of pulp (%)

The yield of pulp was estimated by taking weight of net screened pulp in comparison to weight of fresh fruit and the value was expressed in per cent.

$$\text{Yield of pulp (\%)} = \frac{\text{Weight of pulp}}{\text{Weight of fruit}} \times 100$$

3.6.4 Total soluble solids (%)

Total soluble solids in fresh pineapple fruits and yoghurt were determined at ambient temperature by using hand refractometer with range of 0-32 per cent. The refractometer was standardized with distilled water. For each treatment, there were three replicates and average value was expressed in percentage. The refractometer surface was cleaned with distilled water after each analysis.

3.6.5 pH

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

The pH of fresh fruit and yoghurt was estimated by digital pH meter. The sample in case of fruit pulp and yoghurt was diluted to 1:10 ratio for pH determination.

3.6.6 Acidity (%)

Titratable acidity was estimated as per the method described by Ranganna (2014).

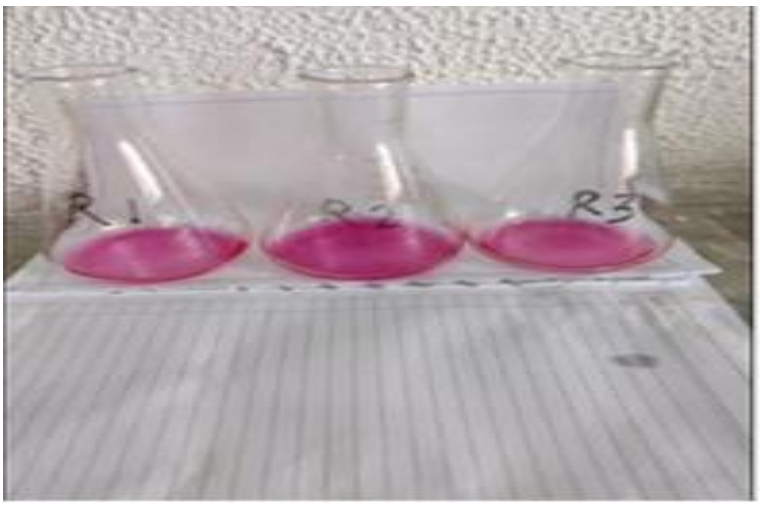
Extraction

Five grams of macerated sample of fresh fruit pulp/yoghurt was taken. After adding distilled water (1:5 w/v), it was kept in a boiling water bath for one hour. It was then filtered, cooled and its volume was made to 100 ml.

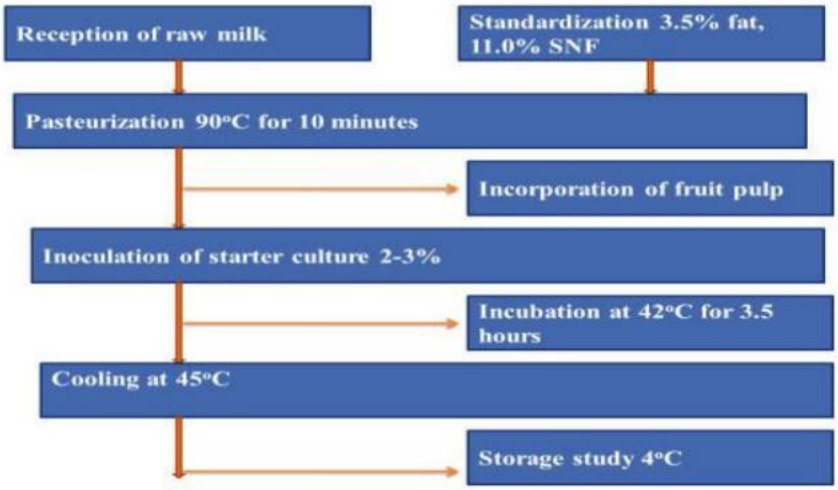
Estimation

A suitable aliquot was titrated against 0.1N NaOH after adding a few drops of 1 per cent phenolphthalein solution as an indicator. The appearance of pink colour was used as end point and the volume of alkali used was noted. The acidity was calculated as per formula and results were expressed as g citric acid per 100 g sample.

$$\text{Acidiity(\%)} = \frac{\text{Titre vol. (ml)} \times \text{Normality of alkali} \times \text{Eq. wt. of citric acid} \times \text{Vol. made (ml)} \times 100}{\text{Vol. of aliquot (ml)} \times \text{Wt. or volume of sample (g or ml)} \times 1000}$$



International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026



CHAPTER 4 - RESULT AND DISCUSSION

The experimental results of the present research work entitled “Development and Evaluation of sweet yoghurt incorporated with fruit pulp (Pineapple)” have been depicted in this chapter under the following sub-headings:

4.1 Physico-chemical characteristics of raw milk and pineapple fruit

The raw milk and pineapple fruit were analysed and the results obtained have been presented in Table 1and Table 2 for various physico-chemical characteristics.

Table 1. Physico-chemical characteristics of raw milk

Sr. No.	Parameters	Raw Milk
1.	Moisture content (%)	79.5%
2.	Fat content (%)	0.4%
3.	Protein content (%)	3.90%
4.	Total soluble solids (%)	14.6
5.	pH (%)	6.49
6.	Acidity (%)	0.62%
7.	Ash content (%)	0.4%

Table 2. Physico-chemical characteristics of pineapple fruit

Sr. No.	Parameters	Pineapple
1.	Fruit weight	1.25 kg
2.	Pulp weight	550gm
3.	Yield of pulp	44%
4.	Moisture content (%)	88%
5.	Ash content (g)	0.46%

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

6.	Protein content (%)	7.6%
7.	Total soluble solids (%)	13.3
8.	Fat content (%)	1.4%
9.	Acidity (%)	1.97%
10.	pH	3.32

4.2 Effect of storage on chemical constituents and sensory quality of sweet yoghurt

4.2.1 pH (%)

Table 3. Effect on pH (%) of sweet yoghurt during storage

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	4.7	4.6	4.5	4.6	4.6
Sample (10 % pineapple pulp)	4.9	4.7	4.6	4.7	4.7
Mean	4.8	4.6	4.5	4.6	
C.D. at 5%					

4.2.1 Acidity (%)

Table 3. Effect on acidity (%) of sweet yoghurt during storage

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	0.75	0.90	0.92	0.92	0.87
Sample (% pineapple pulp)	0.88	0.91	0.93	0.95	0.90
Mean	0.78	0.90	0.92	0.93	
C.D. at 5%					

4.2.1 Moisture content (%)

Table 3. Effect on moisture content (%) of sweet yoghurt during storage

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	86	86.5	87	87	86.6
Sample (% pineapple pulp)	87.5	88	88.5	89	88.2
Mean	86.7	87.2	87.7	88	
C.D. at 5%					

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

4.2.1 Protein content (%)

Table 3. Effect on protein content (%) of sweet yoghurt during storage

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	3.80	3.78	3.76	3.75	**3.77**
Sample (% pineapple pulp)	3.78	3.75	3.73	3.71	**3.74**
Mean	**3.79**	**3.76**	**3.74**	**3.73**	
C.D. at 5%					

4.2.1 Fat content (%)

Table 3. Effect on fat content (%) of sweet yoghurt during storage

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	3.75	3.69	3.60	3.56	**3.65**
Sample (% pineapple pulp)	3.63	3.57	3.53	3.50	**3.55**
Mean	**3.69**	**3.63**	**3.56**	**3.53**	
C.D. at 5%					

4.2.1 Ash content (%)

Table 3. Effect on ash content (%) of sweet yoghurt during storage

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	0.5	0.6	0.7	0.6	**0.6**
Sample (% pineapple pulp)	0.7	0.8	0.6	0.7	**0.7**
Mean	**0.6**	**0.7**	**0.6**	**0.6**	
C.D. at 5%					

4.3 Effects of storage on chemical constituent

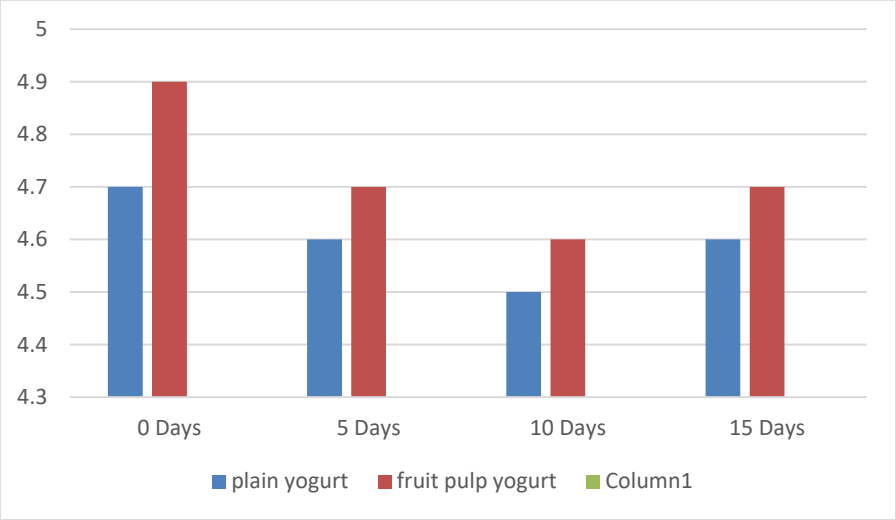
Chemical constituents (moisture content, total solids content, ash content, protein content, fat content, carbohydrate content and pH) of the plain yoghurt and fruit yoghurts were determined and analysed.

4.3.1 pH determination

Highest pH (4.9) was seen in case of yoghurt with 10% fruit pulp on first day of storage, on the other hand, lowest pH (4.5) was recorded in case of yoghurt with 0% pulps on 10^{th} day of storage, as shown in figure 4.3.1. pH was decreased at all concentrations on day (5,10 & 15).

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

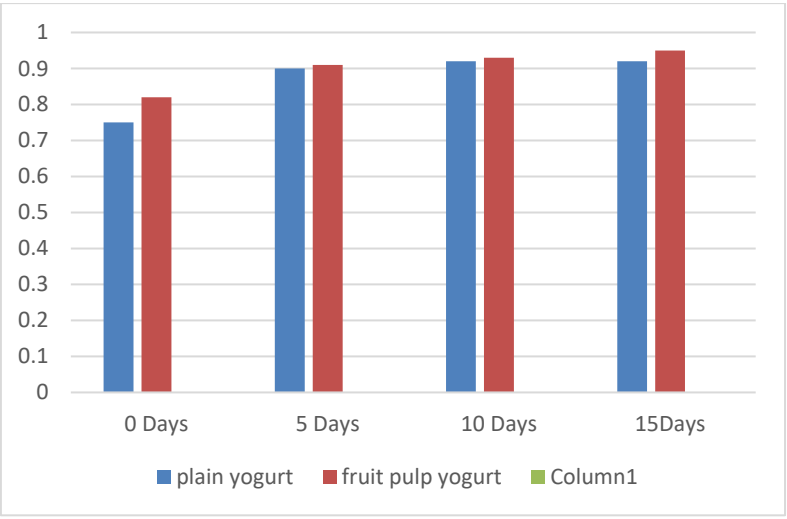
FIGURE 4.3.1: pH of plain and 10% fruit pulp yogurt



4.3.2 Acidity determination

Highest acidity (0.95) was seen in case of yoghurt with 10% fruit pulp on 15th day of storage, on the other hand, lowest acidity (0.75) was recorded in case of yoghurt with 0% pulps on 0 day of storage, as shown in figure 4.3.2. Acidity was decreased at all concentrations on day (0,5 & 10)

FIGURE 4.3.2: Acidity of plain and 10% fruit pulp yogurt

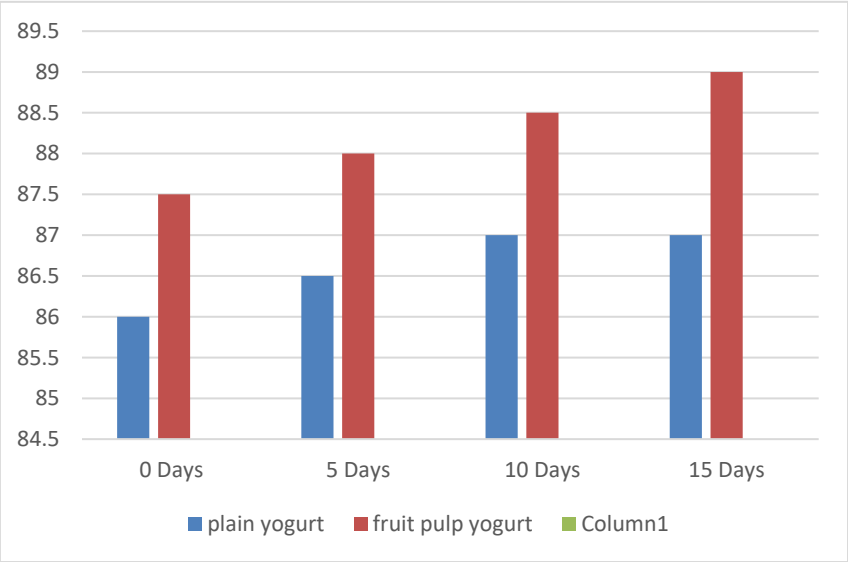


4.3.3 Moisture content determination

Highest moisture (89) was seen in case of yoghurt with 10% fruit pulp on 15th day of storage, on the other hand, lowest moisture content (86) was recorded in case of yoghurt with 0% pulps on 0 day of storage, as shown in figure 4.3.3. Moisture content was decreased at all concentrations on day (0,5 & 10).

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

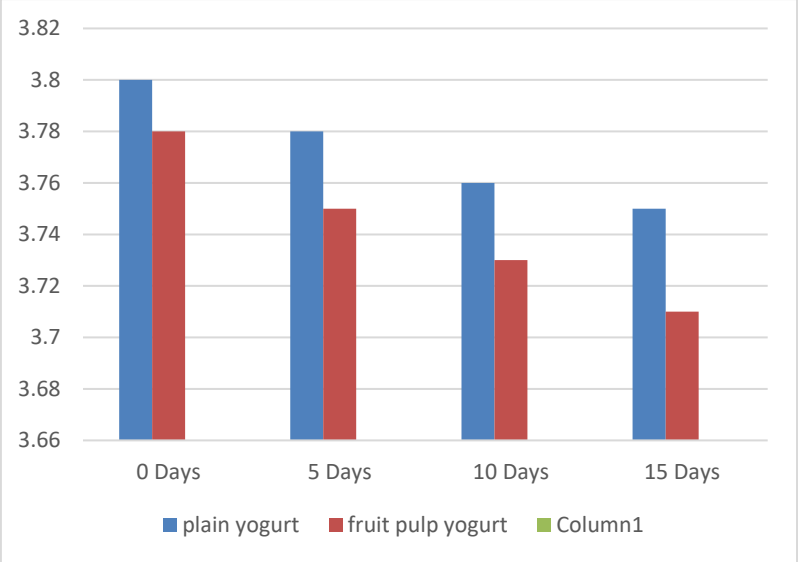
FIGURE 4.3.3: Moisture content of plain and 10% fruit pulp yogurt



4.3.4 Protein content determination

Highest protein content (3.80) was seen in case of yoghurt with 0% fruit pulp on 0 day of storage, on the other hand, lowest protein content (3.71) was recorded in case of yoghurt with 10% pulps on 15th day of storage, as shown in figure 4.3.4. Protein content was decreased at all concentrations on day (5,10 & 15).

FIGURE 4.3.4: Protein content of plain and 10% fruit pulp yogurt

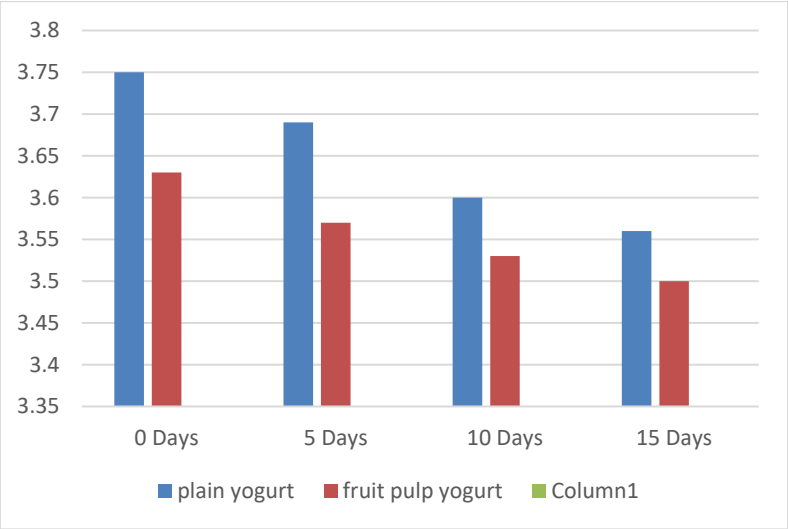


4.3.5 Fat content determination

Highest Fat content (3.75) was seen in case of yoghurt with 0% fruit pulp on 0 day of storage, on the other hand, lowest fat content (3.50) was recorded in case of yoghurt with 10% pulps on 15th day of storage, as shown in figure 4.3.5. Fat content was decreased at all concentrations on day (5,10 & 15).

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

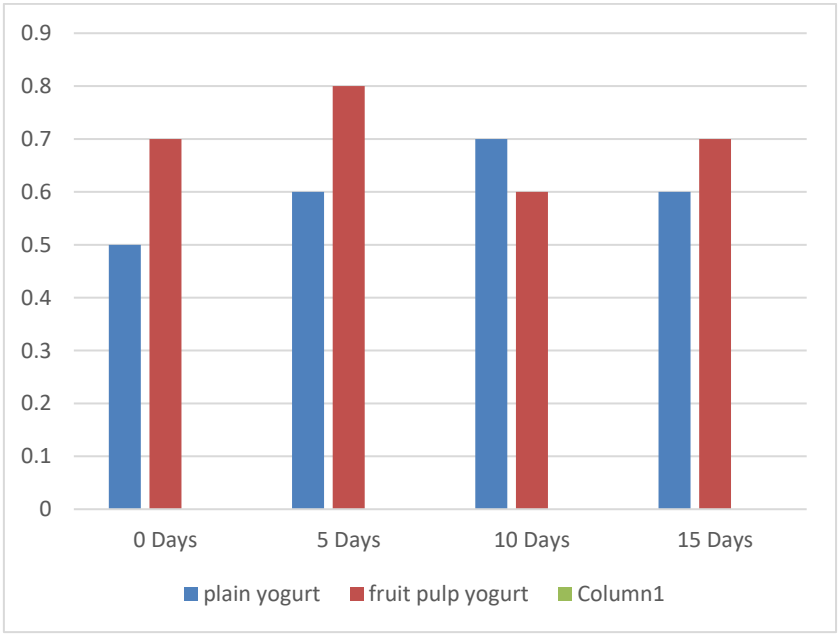
FIGURE 4.3.5: Fat content of plain and 10% fruit pulp yogurt



4.3.6 Ash content determination

Highest Ash content (0.8) was seen in case of yoghurt with 10% fruit pulp on 5th day of storage, on the other hand, lowest ash content (0.5) was recorded in case of yoghurt with 0% pulps on 0 day of storage, as shown in figure 4.3.6. Ash content was decreased at all concentrations on day (5,10 & 15).

FIGURE 4.3.6: Ash content of plain and 10% fruit pulp yogurt



4.4.1 Effect of storage on sensory quality of sweet yogurt

All yoghurt samples were given total points out of 10 for overall physical characteristics for overall acceptability and taste, mouthfeel and flavour, and color and appearance respectively.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

4.2.1 Colour and appearance

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	8.5	8.3	7.5	6.7	7.7
Sample (% pineapple pulp)	8.7	8.3	7.6	6.8	7.8
Mean	8.6	8.3	7.5	6.7	
C.D. at 5%					

4.2.1 Taste

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	8.0	7.5	7.0	6.5	7.25
Sample + (10% pineapple pulp)	8.5	8.0	7.5	6.0	7.8
Mean	8.2	7.9	7.5	6.5	
C.D. at 5%					

4.2.1 Flavour

Table : Showing effect on flavour of product during storage

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	8.5	8.0	7.5	7.0	7.7
Sample (% pineapple pulp)	9.0	8.5	8.3	7.0	8.2
Mean	8.7	8.2	7.9	7.0	
C.D. at 5%					

4.2.1 Mouthfeel

Table : Showing effect on mouthfeel of product during storage

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	8.4	8.0	7.4	6.3	7.5
Sample (% pineapple pulp)	8.7	8.3	7.8	7.0	8.0
Mean	8.5	8.1	7.7	6.6	
C.D. at 5%					

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

4.2.1 Overall acceptability

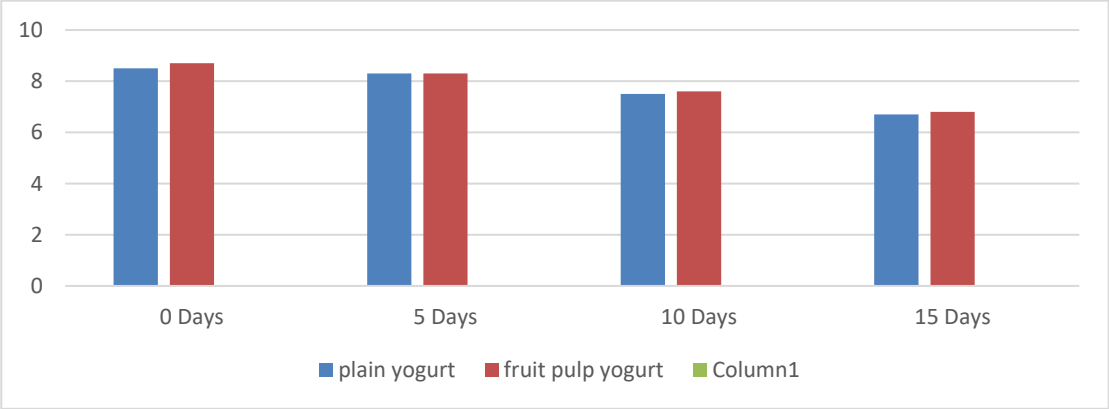
Table : Showing effect on Overall acceptability of product during storage

Treatments	Storage period (days)				Mean
	0	5	10	15	
Control	8.0	7.8	7.5	7.0	**7.5**
Sample (% pineapple pulp)	9.0	8.5	8.0	7.5	**8.2**
Mean	**8.5**	**8.1**	**7.7**	**7.2**	
C.D. at 5%					

4.4.1 colour and appearance analysis

All yoghurt samples were analysed by a team of 10 judges and points were given out of 10 for colour and appearance. Highest average score (8.7) for colour and appearance was seen in case of yoghurt with 10% pineapple pulp on 0 day of storage, on the other hand, lowest average score (6.7) was recorded in case of yoghurt with 0% pineapple pulp on 15th day of storage.

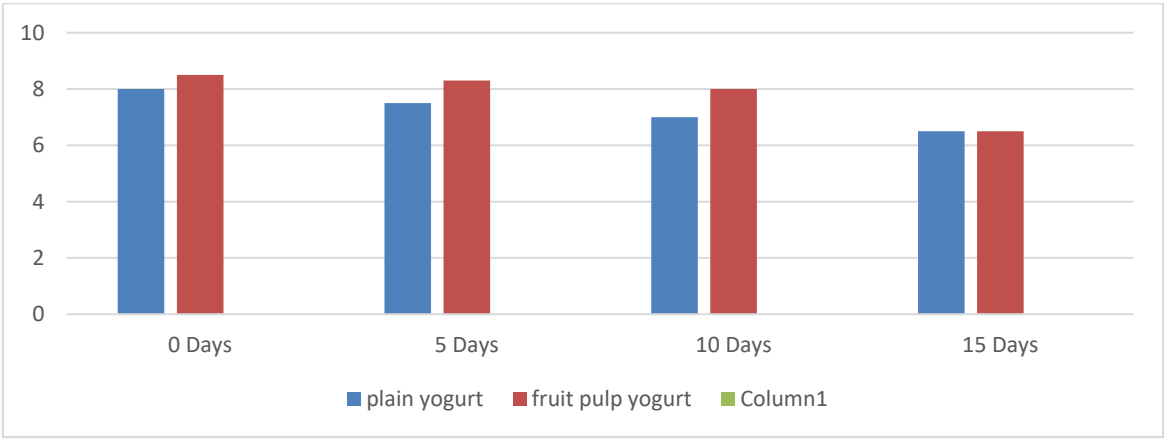
FIGURE 4.4.1: Average scores (out of 10) for colour and appearance of plain yoghurt and fruit yoghurt



4.4.2 Taste analysis

All yoghurt samples were analysed by a team of 10 judges and points were given out of 10 for taste. Highest average score (8.5) for taste was seen in case of yoghurt with 10% pineapple pulp on 0 day of storage, on the other hand, lowest average score (6.5) was recorded in both case of yoghurt with 0% & 10% pineapple pulp on 15th day of storage.

FIGURE 4.4.2: Average scores (out of 10) for taste of plain yoghurt and fruit yoghurt

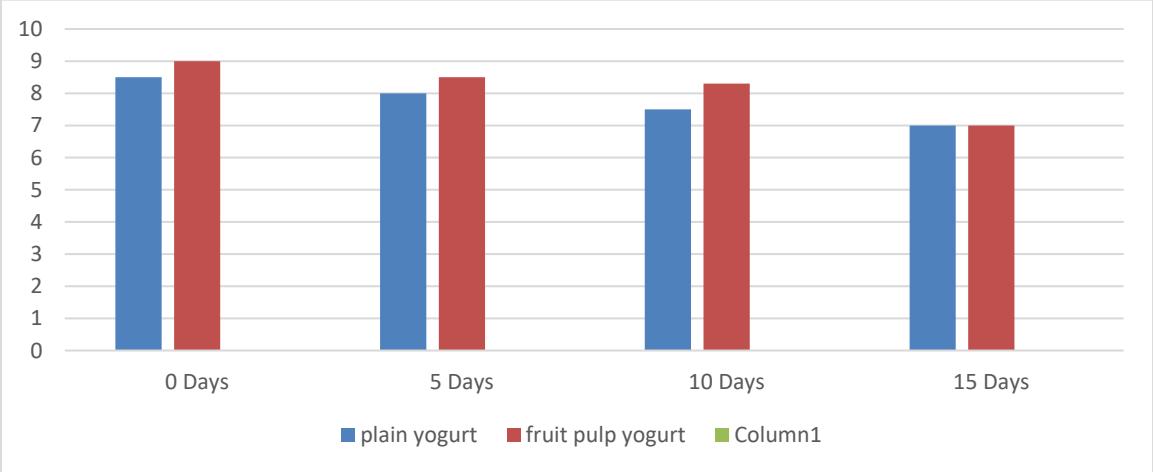


International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

4.4.3 Flavour analysis

All yoghurt samples were analysed by a team of 10 judges and points were given out of 10 for flavour. Highest average score (9.0) for flavour was seen in case of yoghurt with 10% pineapple pulp on 0 day of storage, on the other hand, lowest average score (7.0) was recorded in both case of yoghurt with 0% & 10% pineapple pulp on 15th day of storage.

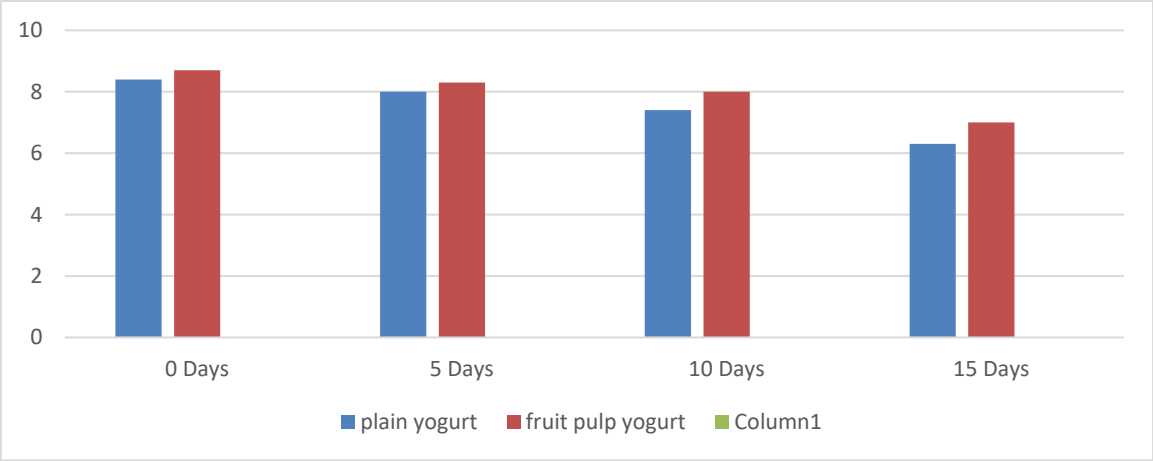
FIGURE 4.4.3: Average scores (out of 10) for flavour of plain yoghurt and fruit yoghurt



4.4.4 Mouthfeel analysis

All yoghurt samples were analysed by a team of 10 judges and points were given out of 10 for mouthfeel. Highest average score (8.7) for mouthfeel was seen in case of yoghurt with 10% pineapple pulp on 0 day of storage, on the other hand, lowest average score (6.3) was recorded in both case of yoghurt with 0% pineapple pulp on 15th day of storage.

FIGURE 4.4.4: Average scores (out of 10) for mouthfeel of plain yoghurt and fruit yoghurt

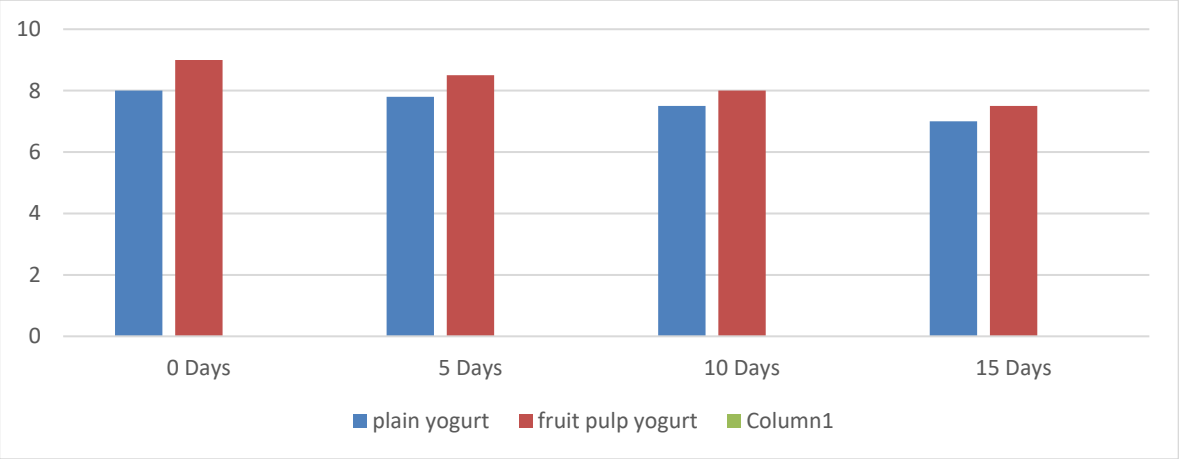


4.4.5 overall acceptability analysis

All yoghurt samples were analysed by a team of 10 judges and points were given out of 10 for overall acceptability. Highest average score (9.0) for overall acceptability was seen in case of yoghurt with 10% pineapple pulp on 0 day of storage, on the other hand, lowest average score (7.0) was recorded in both case of yoghurt with 0% pineapple pulp on 15th day of storage.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

FIGURE 4.4.5: Average scores (out of 10) for overall acceptability of plain yoghurt and fruit yoghurt



CHAPTER 5 - CONCLUSION

The current study supported the conclusion that supplementation of pineapple fruit leads to develop enriched yoghurt with the most desired features in comparison with yoghurt prepared without the addition of fruit. It was analyzed from the present study that the syneresis value declined effectively and total phenolic content increased with the increasing amount of pineapple fruit along with treatments. The total solid content also increased significantly with the increased amount of pineapple fruit. Furthermore, the organoleptic characteristics of fruit yoghurt (T2) prepared with 10% pineapple fruit have gained better acceptability as compared to other fruit yoghurt prepared with 5% and 15% fruit.

The present study revealed that the addition of pineapple fruit on yoghurt considerably effect ($p < 0.01$) the taste of developed yoghurt because of various concentrations of fruit along with treatments (Table 4). The taste of the yoghurt sample reduced considerably during storage conditions. Most excellent scores were observed for treatment T_2 with 10% of pineapple fruit supplementation. The reduction in values of taste for fruit yoghurt possibly due to the purification of milk protein because of the proteolytic activities of bacteria. The present finding revealed that the addition of pineapple has a highly significant influence ($p < 0.01$) on the overall acceptability of yoghurt due to various concentrations of pineapple during storage. It was noticed from the mean value that the yoghurt sample with 10% fruit pulp has the best overall acceptability than other samples with 5% and 15% pineapple.

REFERENCES

[1] S. Sarkar. Innovations in Indian Fermented Milk Products-A Review. *Food Biotechnology*. 22:78-97 (2008).
[2] V. Jaglan., A. Ojha., A. Singh, R. Singh, and S. Gaur. Development of novel herb supplemented soymilk fortified fruit based dairy yoghurt. *Journal of Pharmacognosy Phytochemistry*. 7: 1621-1625 (2018).
[3] H. Xue., Z. Yang., X. Jing, P. Yu, Y. Zhang, H. Yi, and L. Zhang. Improvement of the Texture of Yogurt by Use of Exopolysaccharide Producing Lactic Acid Bacteria. *BioMedical Research International*. 4: 7-14 (2016).
[4] A. Armuzzi., J. Cremonini., F. Bartolozzi, M. Candelli, and O. Jetti. The effect of oral administration of Lactobacillus GG on antibiotic-associated gastrointestinal side effects. Aliment. Pharmacological Ther. 15: 163-169 (2001).
[5] H. Kiani., M. E. Mosari., H. Razavi, and E.R. Morris. Effect of Gelatin, alone and in combination with HM- pectin, on the structure and stability of doogh, a yogurt based Iranian drink. *Food Hydrocolloid*.24: 74-75 (2010).
[6] P.J.Sanchez-Segarra., M. Garcia-Martinez., M.J. Gordillo- Otero, A. Diaz-Valverde, M.A. Amaro-Lopez, and R. Moreno-Rojas. Influence of the addition of fruit on mineral content of yoghurts: nutritional assessment. *Food Chemistry*. 70: 85-89 (2000).
[7] P. Ariaii., M. Mahmoudi, and R. I. Amoli. The production of fruity yoghurt with banana flavor.Food Science and Technology Department of Islamic Azad University. 6: 368-370 (2011).
[8] R.Agarwal.probiotics: Anemergingfoodsupplement with health benefits. *Food Biotechnology*. 19: 227-246 (2009).
[9] A. Livngh, and T. Wadstrom. Lactic acid bacteria as probiotics. *Current Interest in Microbiology*. 7: 73-89 (2006).
[10] P. Aswal., A. Shukla, and S. Priyadarshi. Yoghurt: Preparation, characteristics and recent advancements.*Center for Injury Biomechanics Technology Journal of Bio-Protocols.* 1:32-44
[11] J. N. Khedkar., D. M. Choudhari., B. K. Pawar, and V. S. Kadam. Development of fruit based yoghurt.
[12] *Research Journal of Animal Husbandry and Dairy Science.* 6: 72-75 (2015).
[13] R. H. Liu. Potential synergy of phytochemicals in cancer prevention: Mechanism of action. *Journal of Nutrition*. 134:3479-3485 (2004).
[14] M. A. Njoya., C. W. Nain., P. Y. Mahbou, S. D. Mendi, and H. Imele. Physicochemical and sensory properties of pawpaw (*Carica papaya Linn*) flavoured yoghurt. *African Journal of Food,Agriculture, Nutrition and Development*. 17: 23-24 (2017).

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

[15] S. Arslan, and S. Bayrakci. Physicochemical, functional, and sensory properties of yogurts containing pineapple. *Turkish Journel of Agriculture*. 40:68-74 (2016).
[16] S. Karaman., O. S. Toker., M. Çam, M. Hayta, M. Doğan, and A. Kayacier. Bioactive and physicochemical properties of pineapple as affected by drying methods. *Drying Technology*. 32: 258-267 (2014).
[17] S. Ercisli., M. Akbulut., O. Ozdemir, M. Sengul, and E. Orhan. Phenolic and antioxidant diversity among pineapple (*Diospyrus kaki* L.) genotypes in Turkey. *International Journal of Food Science and Nutrition*. 59: 77-82 (2007).
[18] S. B. Masood., M.T. Sultan., M. Aziza, A. Nazc†, W. Ahmeda, N. Kumard, and M. Imrane. pineapple fruit: hidden phytochemicals and health claims. *Experimental Clinic Journal*. 14:542- 561 (2015).
[19] S. Yaqub., U. Farooq., A. Shafi, K. Akram, M. A. Murtaza, T. Kausar, and F. Siddique. Chemistry and functionality of bioactive compounds present in pineapple. *Journal of Chemistry*. 65: 19-26 (2016).
[20] T. Getenesh., A. Keba., Z. Assefa, B. Agza, and F. Kassa. Development of Fruit Flavored Yoghurt with pineapple (*Mangifera indica* L.) and Papaya (*Carica papaya* L.) Fruits Juices. *Food Science and Quality Management.* 67: 6-9 (2017).
[21] P. Nazni, and K. Komathi. Quality characteristics and acceptability of papaya pulp incorporated yoghurt. *International Journal of Food and Nutrition Science.* 3: 76–78 (2014).
[22] S. T. S. K.Warakaulle., W. A. D. V. Weerathilake, and N. R. Abeynayake. Production and evaluation of set type yoghurt incorporated with watermelon (*Citralluslanatus*). *International Journal of Scientific and Research Publications.* 4: 1-4 (2014).
[23] S. Arslan, and S.Ozel. Some properties of stirred yoghurt made with processed grape seed powder, carrot juice or a mixture of grape seed powder and carrot juice. *Milchwissenschaft.* 67:281–285 (2012).
[24] K. Singh., R. Chandra, and S. Shukla. Studies on chemical properties of low-fat frozen yoghurt prepared with mixing of varying pulp level of different fruits. *The Pharmacological Innovation*. 5: 6-12 (2016).
[25] A. M. Farahat, and O. I. El-Batawy. Proteolytic activity and some properties of stirried fruit yoghurt made using some fruits containing proteolytic enzymes. *World Journal of Dairy & Food Sciences.* 8: 38-44 (2013).
[26] AOAC. Official Methods of Analysis. The Association of Official Analytical Chemists. 18th Ed. Arlington, VA, USA. 1-48 (2006).
[27] D. C. Montgomery. Design and Analysis of Experiments. 7th Ed. John Wiley and Sons. Inc. Hoboken, NJ, USA. 162-264 (2008).
[28] T. Amatayakul., F. Sherkat, and N. P. Shah. Syneresis in set yogurt as affected by EPS starter cultures and levels of solids. *International Journal of Dairy Technology*. 59: 216-221 (2006).
[29] E. A. Guz., E. G. Novitskaya., T.K. Kalenik, L.V. Levochkina, and W. Piekoszewski. The influence of vegetable puree containing carotenoids on the nutrient composition and structure of milk yoghurt. *International Journal of Dairy Technology*. 70:1-7 (2017).
[30] M. C. Meilgaard., G. V. Civile, and B. T. Carr.Sensory evaluation techniques. 4th Ed. CRC Press. Boca Raton, FL, USA. 1-464 (2007).
a. I. T. Khan., M. Nadeem., M. Imran, M. Asif, M. Khan, A. Din, and R. Ullah. Triglyceride, fatty acid profile and antioxidant characteristics of low melting point fractions of Buffalo Milk fat.*Lipids in health and disease*. 18:1-11 (2019).
[31] V. Thakore, and N. K. Jain. Protein and fat examination from the raw milk of different mammalian species (Cow, buffalo, goat, and human) with successive lactation days. P*harmacology Innovation*. 7: 506-510 (2018).
[32] X. Han., F. L. Lee., L. Zhang, and M. R. Guo. Chemical composition of water buffalo milk and its low-fat symbiotic yogurt development. *Functional Foods in Health and Disease*, 2: 86-106 (2012).
[33] F. N. Talpur., N. N. Memon, and M.I. Bhanger. Comparison of fatty acid and cholesterol content of pakistan water buffalo breeds.*Pakistan Journal of Analytical and Environmental Chemistry.* 8: 15-20 (2007).
[34] S. Ahmad., F. M. Anjum., N. Huma, A. Sameen, and T. Zahoor. Composition and physico-chemical characteristics of buffalo milk with particular emphasis on lipids, proteins, minerals, enzymes and vitamins. *Journal of Animal Plant Science*. 23:62-74 (2013).
[35] C. D. Khedkar, S. D. Kalyankar and, S. S. Deosarkar. Buffalo milk. In: B. Caballero, P. Finglas, and Toldra, (Eds). The Encyclopedia of Food and Health. 1: 522-528 (2016).
[36] S. Sakanaka, Y. Tachibana, and Y. Okada. Preparation and antioxidant properties of extract of Japanese pineapple leaf tea (kakinoha-cha).*Food Chemistry*. 89:569-575 (2005).
[37] J. H. Lee, Y. B. Lee, W. D. Seo, S. T. Kang, J. Lim, and K. M. cho. Comparative studies of antioxidant activities and nutritional condtituentsof pineapple juice ().*Preventive Nutrition and Food Science.* 17:141 (2012).
[38] A. Celik, and S. Ercisli. pineapple cv. Hachiya, (*Thunb*.) fruit: some physical, chemical and nutrional properties. I*nternational Journal Food Science Nutrition.* 59: 599-606, (2008).
[39] E. E. Candir, A. E. Özdemir, and M. Kaplankýran. Physicochemical changes during growth of pineapple fruits in the East Mediterranean climate region. *Science Horticulture*. 121: 42-48 (2009).
[40] X. N. Chen., J. F. Fan., X. Yue, X. R. Wu, and L. T. Li. Radical scavenging activity and phenolic compounds in pineapple (L. cv. Mopan).*Journal of Food Science.* 73:24-28 (2008).
[41] T. Anuyahong., C. Chusak,and S. Adisakwattana. Incorporation of anthocyanin-rich riceberry rice in yogurts: Effect on physicochemical properties, antioxidant activity and in vitro gastrointestinal digestion. *Lwt—food Science and Technology.* 129: 109571 (2020).
[42] D. F.da Silva., N. N. T.Junior., R. G. Gomes, M. S.dos Santos Pozza, M.Britten, and P. T. Matumoto- Pintro. Physical, microbiological and rheological properties of probiotic yogurt supplemented with grape extract. *Journal of Food Science & Technology.* 54: 1608– 1615(2017).
[43] D. Liu, and X. X. Lv. Effect of blueberry flower pulp on sensory, physicochemical properties, lactic acid bacteria, and antioxidant activity of set-type yogurt during refrigeration. *Journal of Food Processing and Preservation.* 43:13856(2019).
[44] Ö. Dönmez., B. A.Mogol,andV.Gökmen. Syneresis and rheological behaviors of set yogurt containing green tea and green coffee powders.*Journal of Dairy Science.* 100: 901– 907(2017).
[45] M. P. N. Nguyen. Physicochemical characteristics, viability of starters, total phenolics and antioxidant activities of functional yoghurt supplemented with extracts from Hylocereuspolyrhizus, Hibiscus sabdariffa and Peristrophebivalvis.*Plant Science Today.* 8:149-154 (2021).
[46] Codex Alimentarius. *Codex standard for fermented milks (CODEX STAN 243–2003). Adopted in 2003, Revision* 2008. FAO (2010).
[47] E. P. Madora., T. K. Takalani, and M. E. Mashau. Physico-chemical, microbiological and sensory properties of low fat yoghurt fortified with carrot powder. *International Journal of Agriculture and Biological Engineering.* 9: 118-124 (2016).
[48] A. Petridis., D. Petridis, and G.Dimitreli. A novel dairy fermented frozen dessert with honey and pomegranate juice: physicochemical, rheological and sensory properties. *Journal of Food Research.* 9:52-66 (2020).

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 08 , August - 2026

[49] G. Teshome., A. Kebal., Z. Assefa, B. Agza, and F. Kassal. Development of fruit flavored yoghurt with pineapple (*Mangifera indica* L.) and papaya (*Carica papaya* L.) fruits juices. *Food Science and Quality Management.* 67: 2224-6088 (2017).
[50] D. K. D. Roy., T. Saha., M. Akter, M. Hosain, H. Khatun, and M.C. Roy. Quality Evaluation of Yogurt Supplemented with Fruit Pulp (Banana, Papaya, and Water Melon. *International Journal of Nutrition and Food Sciences*. 4:695-699 (2015).
[51] S. C. S. R. de Moura., F. Z. Vissotto., S. A.G. Berbari, E. D. C. G. Souza, F. G. P. Toti, and P. A. Júnior. Stability of bioactive compounds in fruit smoothies. (2021).
[52] A. Buchilina, and K. Aryana. Physicochemical and microbiological characteristics of camel milk yogurt as influenced by monk fruit sweetener. *Journal of Dairy Science.* 104:1484-1493 (2021).

[53] Y. HHui., L. M. L. Nollet., F.Toldrá, S.Benjakul, and G. Paliyath. In B. K. Simpson (Ed.). *Food biochemistry and food processing. John Wiley & Sons Inc.* (2012).
[54] K. Kailasapathy. Survival of free and encapsulated probiotic bacteria and their effect on the sensory properties of yoghurt.*LWT-Food Science and Technology*. 39: 1221– 1227 (2006).
[55] M. Michael., R.K. Phebus, and K.A. Schmidt. Plant extract enhances the viability of Lactobacillus delbrueckii subsp. bulgaricus and Lactobacillus acidophilus in probiotic nonfat yogurt. *Food science & nutrition.* 3:48-55 (2015).
[56] M. P. N. Nguyen. Physicochemical characteristics, viability of starters, total phenolics and antioxidant activities of functional yoghurt supplemented with extracts from Hylocereuspolyrhizus, Hibiscus sabdariffa and Peristrophebivalvis. *Plant Science Today.* 8:149-154 (2021).
[57] W. A. D. C. Gunawardhana, and H. N. N. Dilrukshi. Development of yoghurt drink enriched with avocado pulp (Perseaamericana). *International Journal of Advance Scientific Research and Management.* 1: 97-102 (2016).
[58] S. Bakirci., E. Dagdemir., O. S. Boran, and A.A.Hayalogl u. The effect of pumpkin fiber on quality and storage stability of reduced-fat set type yoghurt. *International Journal of Food Science and Technology.* 52: 180-187 (2017).
[59] E. Ismail., M. Shenana., M. Elalfy, E. Essawy, and S. Abdelhahim.. Novel Probiotic Adjunct Cultures for the Production of Fruit-Flavoured Drinkable Yoghurt. *Egyptian Journal of Food Science*. 48: 213-228 (2020).
[60] O. M. Mohamed., M.O. Abdallai., N.M. Fawi, S.O. Ahmed, E.G. Mohamed, and G.E. Ahmed. Quality evaluation of stirred yoghurt flavoured with Guddaim (*Grewia tenax*) fruit. A*sian Journal of Agriculture and Food Science.* 3: 27-33 (2017).
[61] A. Brodziak., J. Król., A. Matwijczuk, T. Czernecki, Glibowski, Ł. Wlazło, and A. Litwińczuk. Effect of Sea Buckthorn (*Hippophaerhamnoides* L.)
[62] Mousse on Properties of Probiotic Yoghurt. *Applied Sciences.* 11:545 (2021).
[63] M. Obodoechi, and N. C. Okoronkwo. Production and quality evaluation of flavoured yoghurt from graded levels of sweet variety of African bush pineapple "Ugiri" (Irvingiagabonensis) juice and pulp. *Food Science and Technology.* 5: 56-69 (2017).
[64] M. M. Desouky. Effect of using cactus pear pulp on the properties of goats' milk bioyoghurt drinks. *Egypt. Journal of Food Science*. 46: 25-41 (2018).
[65] N. I. E. Mbaeyi., L. C. Umeh., C. J. Igbokwe, C. M. Obodoechi, and N. C. Okoronkwo. Production and quality evaluation of flavoured yoghurt from graded levels of sweet variety of african bush pineapple" Ugiri"(Irvingiagabonensis) juice and pulp. *Food Science and Technology.* 5: 56-69 (2017).
[66] K. C. Dey., R. Begum., M.R.T. Rahman, A. Sultana,Akter, and R.J. Janny. Development of fruit juice yoghurt by utilization of jackfruit juice: A preliminary study on sensory evaluation, chemical composition, and microbial analysis. *International Journal of Engineering Research and Technology.*3: 1074-1079 (2014).
[67] V. Raut., P. Sawant., D. Sawant, and A.S. Ingole. Studies on preparation of pineapple yoghurt drink. *Asian Journal of Dairy and Food Research*.34: 13- 17 (2015).
[68] A. A. Matter., E. A. M. Mahmoud, and N. S. Zidan. Fruit flavored yoghurt: chemical, functional and rheological properties. *International Journal Environment and Agriculture Research.*2: 57-66(2016).
[69] S. Sengupta., A. Chakraborty, and J. Bhowal. Production and evaluation of yoghurt with watermelon (Citrulluslanatus) juice. *Journal of International Academic Research. Multidisciplinary*, 2: 249-257 (2014).
[70] A. Palka, and A. Flis-Kaczykowska. Evaluation of extract and fat content in selected fruit and fruit-vegetable yogurts (available on the market). *Scientific Journal of Gdynia Maritime University* (2019).
[71] S. Subhashini., D. Baskaran., B. Dhanalakshmi, B. Murugan, and A.P. Manoharan. Physicochemical properties of grape (VitisviniferaL.) pomace fortified drinkable yoghurt. *International Journal Current Microbiology Applied Science.* 7:2875-2880 (2018).
[72] B. A. Öztürk, and M. D. Öner. Production and evaluation of yogurt with concentrated grape juice. *Journal of Food Science.* 64: 530-532 (1999).
[73] A. Ayla., A. S. Mehmet, and B. Ihsan. The effects of adding *Hibiscussabdariffa* L. flowers marmalade on some quality properties,mineral content and antioxidant activities of yogurt. *Journal of Food Science Technology*.5:1-20 (2020).
[74] D. Dimitra., S. Nikoletta., K. Evangelos, and K. Panagiotis. Yoghurtssupplemented with juices from grapes and berries. *Foods*.9:1158 (2020).
[75] A. Amal., A. M. Eman, and S. Z. Nahla. Fruit flavored yoghurt. Chemical, functional and rheological properties. *International Journal of Environmental and Agriculture Research.* 2: 57-66 (2016).
[76] E. A. M. Ahmed. Production of functional drinking yoghurt supplemented with strawberry and berry fruits. *Journal of Food and Dairy Science. Mansoura*
[77] *University.*8: 263-266 (2017).
[78] M. M. Ismail., M.F. Hamad, and E.M. Elraghy. Rheological, physicochemical, microbial, and sensory properties of bio-rayeb milk fortified with pulp. *International Journal of Food Science and Biotechnology.*1: 8-18(2016)
[79] M. N. A. Hammad. Studies on producing some therapeutic dairy products. Ph.D. Thesis, Fac.
[80] Agric., Moshtohor, Benha University Egypt (2019).
[81] G. Ritu., H. A. P. K. Hai, and K. S. Naveen. Development and Quality Evaluation of Yoghurt
[82] Fortified with Pineapple, Apple and Sweet Lemon Juice (Fruit Yoghurt). *International Journal of Engineering and Research Technology.* 5: 2-5, (2016).
[83] E. K. Yagmur., V.Y. Yil., I. Itlun. Determination of Texture Profile Analysis of Yogurt Produced by Industrial and Traditional Method. *International Journal of Scientific and Technological Research.* 4: 2422-8702 (2018).
[84] S. J. Chye., R. Ahmad, and A. A. Noor Aziah.Studies on the physicochemical and sensory characteristics of goat's milk dadih incorporated with tropical-fruit purees. *International Food Research Journal.* 19:1387-1392 (2012).
[85] S. S. Mohammad., A. M. Sani., M. Hojjatoleslamy. Physicochemical, microbiological and sensory characteristics of strawberry yoghurt fortified with Red beet extract. *Indian Journal.* 9: 187-193 (2013).