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# Preparation of Low calorie dietetics desserts using custard apple and strawberry

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**Abstract**
An experiment was conducted to develop low calorie desserts using custard apple and strawberry. The custard apple (*Annona squamosa* L.) is notified as a non-conventional, climacteric and highly perishable tropical type of fruit. The custard apple fruit is mostly used as a dessert because of its delicious taste and nutritive value. Strawberry fruits are not only attractive for their delicious taste and fresh aroma, but also for their nutritional values and antioxidant properties. Strawberry is a small, juicy, very flavorful and sweet in taste. Desserts were produced using the traditional open pan method. The physico-chemical properties showed moisture content 66.3-76.38%, total ash 1.09-1.72%, crude protein 5.33-8.92%, total fat 0.18-0.27%, carbohydrates 16.36-22.94%, total solids 23.62-33.70%, crude fibre 0.69-2.22%, titratable acidity 0.21-1.15%, total soluble solids 15.24-23.61$^0$B and pH 4.19-5.47 and energy 91.16-129.58kcal. There was a significant difference at ($P<0.05$) in moisture, ash, protein total sugar, reducing sugar, crude fibre, acidity, TSS and pH.

**Keywords:** low calorie desserts, custard apple, strawberry physico-chemical analysis

## 1. Introduction
A dessert is a type of food that is eaten after lunch or dinner. It is usually a sweet food, like ice cream, cookies, and cakes. In some countries, cheeses such as Brie cheese and fruit are served as dessert. Some desserts are decorated, like birthday cakes. Others are simple, like pudding. Desserts are made by blending the ingredients in a freezer. Frozen desserts include ice cream (a mixture of cream, milk, sugar, and flavorings). Fruit is also commonly found in dessert courses because of its natural sweetness. Many different cultures have their own variations of similar desserts around the world, such as in Russia, where many breakfast foods such as blini, oladyi, and syrniki can be served with honey and jam to make them popular as desserts. Low-calorie desserts contain less sugar and fat and do not provide adverse health benefits. Custard apple and strawberry is the main raw material for its production. Low-calorie desserts have a variety of applications like in cookies, puddings, ice cream etc. Due to rise in consumer expenditure and increase consumer health awareness, low-calorie desserts market is growing.

Custard apple is a fruit from the small tree named *Annona squamosa* which belongs to the family Annonaceae of the order Magnoliales (Saha, 2011) [12]. It is also called Sugar Apple. Custard Apple is a sweet fruit, which is widely grown across the world**.** It is grown in West Indies, Phillipines, Taiwan, USA and India. In India, custard apple is grown in Maharashtra, Gujarat, Andhra Pradesh, Uttar Pradesh, Madhya Pradesh, Bihar, Assam, Rajasthan, Orissa and Tamil Nadu. Its cultivation in India has been estimated to be 53,000 hectares with an annual production of 2770 thousand million tons (Annonymous, 2010). The fruit has pleasant texture and flavour and is sweet with slight acidity. Food value lies mainly due to its sugar content which is about 12.4-18.15% and protein 1.6%. Custard apple contains 73.3% Moisture, 0.3% fat, 0.7% mineral matter, 3.1% fiber, 23.9% carbohydrate, 0.2% calcium, 0.04% phosphorous and 1.0% iron (Andrade, *et al.,* 2001). Sugar apple was categorized as having very high antioxidant activity i.e. >70mmol/100g edible part. The custard apple also contains traces of sodium, magnesium, pantothenic acid, ascorbic acid and B vitamins (Seema *et al.*, 2008) [13]. The health and medicinal benefits of the custard apple fruit are numerous even though the leaves or seeds have also been shown to possess significant bioactivity. Sitaphal is comparatively high calorie fruit and thus is included in diet for weight gain for athletes. The fruit has antioxidant activity making it suitable even for diabetic patients. Custard Apple pulp increases haemoglobin levels by up to 21%. (Rios *et al.*, 2003) [10]. It reduces total cholesterol level by 46% in normal and 32.4% in diabetic with increased HDL-cholesterol (Gupta *et al.,* 2005) [7]. Strawberries are an excellent source of antioxidant-promoting vitamin C and manganese. They are also a very good source of dietary fiber, iodine, and folate. Plus, strawberries are a good source of copper, potassium, biotin, phosphorus, magnesium, vitamin B6, and omega-3 fatty acids. (Nikniaz *et al.*, 2009) [9]. Strawberry is acidic. The pH (measure of acidity) of whole, ripe strawberries ranges from 3.3 to 3.6. Freezing, drying and making jam and jellies are some of the best ways to preserve. Strawberry contains 89.9-90 % moisture, 0.7 % protein, 0.3% fat, 5 % total sugars, 1.3 % crude fibre, energy value of 37 Kcal per 100 g of fruits. It has 0.52 to 2.26 % acidity (as citric acid) and contains 0.5 % total minerals among which are (mg/100 g) phosphorus (23), potassium (161), calcium (13), sodium (1.5) and magnesium (11.7). It contains 37 mg of ascorbic acid per 100 g of fruits. It is generally considered to be a poor source of other vitamins as it contains (mg/100 g) carotene (0.15), thiamine (0.03), riboflavin (0.027) and nicotinic acid (0.6) (Chavan 2015) [6].

Skim milk is a dairy product which contains an extremely low

fat percentage. In some countries skim milk is defined as fat free milk, since many labeling laws allow foods with negligible fat contents to be labeled as a fat free. For people who are concerned about the amount of fat in their diets, skim milk is an excellent alternative to whole milk, although some individuals do not enjoy the flavor.

## 2. Materials and methods

### 2.1 Raw Material

Skim milk was collected for student training Dairy, SHUATS. Custard apple, strawberry and sugar was procured from local market of Allahabad. All the chemicals used in the present study were purchased from S.D. Fine Chemicals Ltd. Mumbai, India.

### 2.2 Processing of low calorie desserts

Selected fresh mature strawberry and custard apple was weighted and washed thoroughly with cold water.

### 2.3 To prepare strawberry pulp custard apple pulp

Put the strawberries and their juice in the bowl of a food processor or blender and process the berries until they are pureed**,** Remove seeds from custard apples, take out its pulp/ flesh and grind it to a paste

### 2.4 Procedure

Desserts were finally prepared using optimum levels of custard apple pulp: and strawberry pulp. In a pan, boil skim milk and adding 0.5% sugar, stirring continuously add the fruit pulp in different combination and the mixture was heated till the TSS content reached 20-25 $^0$Brix. Remove from flame and pour it into a cup and keep it in the refrigerator till set. Different fruit pulp was added in the formulations of desserts.

**Flow diagram for manufacturing Custard Apple and Strawberry pulp desserts**

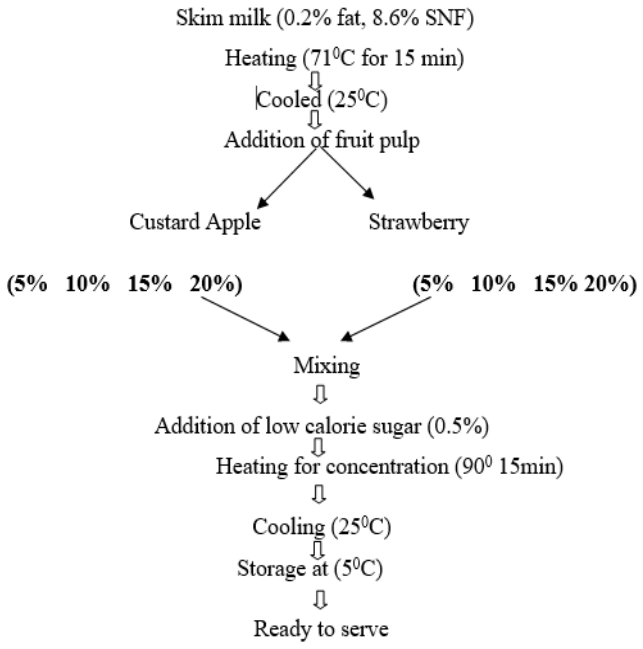


**Fig 1:** Flow diagram for manufacturing Custard Apple and Strawberry pulp desserts

**Sample preparation**

$C_1 S_1 M_1$= Desserts prepared with 5% CP+5% SP+ 90%SM
$C_1 S_2 M_2$= Desserts prepared with 5% CP+10% SP+85SM
$C_1 S_3 M_3$ = Desserts prepared with 5% CP+15% SP+80SM
$C_1 S_4 M_4$= Desserts prepared with 5% CP+20% SP+75SM
$C_2 S_1 M_1$= Desserts prepared with 10% CP+5% SP+85SM
$C_2 S_2 M_2$= Desserts prepared with 10% CP+10% SP+80SM
$C_2 S_3 M_3$= Desserts prepared with 10% CP+15% SP+75SM
$C_2 S_4 M_4$= Desserts prepared with 10% CP+20% SP+70SM
$C_3 S_1 M_1$= Desserts prepared with 15% CP+5% SP+80SM
$C_3 S_2 M_2$= Desserts prepared with 15% CP+10% SP+75SM
$C_3 S_3 M_3$= Desserts prepared with 15% CP+15% SP+70SM
$C_3 S_4 M_4$= Desserts prepared with 15% CP+20% SP+65SM
$C_4 S_1 M_1$= Desserts prepared with 20% CP+5% SP+75SM
$C_4 S_2 M_2$= Desserts prepared with 20% CP+10% SP+70SM
$C_4 S_3 M_3$= Desserts prepared with 20% CP+15% SP+65SM
$C_4 S_4 M_4$= Desserts prepared with 20% CP+20% SP+60SM

### 2.5 Physico-chemical properties

At first analysis carried out for raw fruits and subsequently for processed products. Oven drying method described by the Association of Official Analytical Chemists (AOAC, 1990) [5] was used for determination of moisture content by weighing in crucible and drying in oven at 105$^0$C, until a constant weight was obtained. Determination of ash content was done by muffle Furness at 550$^0$C for 3h. The Kjeldah method was used to determine the protein content (Rangana S., 1986). Carbohydrate was determined by chemical method ((AOAC method 2000) [6]. Crude fibre was determined by chemical method (AOAC, 1990) [5]. Fat by (AOAC method 1990) [5]. The acidity was determined by titration using standard sodium hydroxide solution and expressed as anhydrous citric acid. pH was measured by a pH meter and total soluble solids (TSS) estimated by hand referectometer. The energy value (kJ) was obtained as a calculated value from the overall percentages of the fat, protein and carbohydrate. It is expressed in kilo cal per gram (kcal/100g) of the dry matter in the sample (James, 1995).

### 2.6 Statistical Analysis

Results obtained from the chemical and sensory analysis were subjected analysis of variance (ANOVA) using SPSS software. The means score were separated by least significant Difference (LSD) tests. The significance were separated at $p<0.05$

## 3. Results and discussion

The results of various experiments conducted during the study period are summarized below.

### 3.1 Physico-chemical characteristics of raw material

The composition of custard apple pulp and strawberry fruits changes depending on climate, soil, region and degree of ripeness etc. The present study shows that the custard apple pulp and strawberry contained percentage of moisture 74.00±12.16, 91.66±5.94; ash 1.05±1.00, 0.40±0.20; Crude protein 2.80±0.30, 2.39±0.35; fat 0.39±0.35, 1.13±0.21, carbohydrates 21.50±10.95 5.43±5.67, and Crude fibre 3.30±0.60, 2.90±0.36 respectively. Custard apple contain 1.6% Protein 73.3% Moisture, 0.3% fat, 3.1% fiber, 23.9%

carbohydrate (khan and Roat, 1953, Andrade, *et al.*, 2001). Strawberry contains 89.9-90 % moisture, 0.7 % protein, 0.3% fat, 5 % total sugars, 1.3 % crude fibre, of fruits. It has 0.52 to 2.26 % acidity (as citric acid) (Chavan 2015) [6].

**Table 1**: Chemical composition of custard apple pulp and strawberry (n=3)

| Parameters | Custard apple pulp | Strawberry pulp |
|---|---|---|
| Moisture (%) | 74.00±12.16 | 91.66±5.94 |
| Ash (%) | 1.05±1.00 | 0.40±0.20 |
| Crude Protein (%) | 2.80±0.30 | 2.39±0.35 |
| Fat (%) | 0.39±0.35 | 0.13±0.21 |
| Carbohydrates (%) | 21.50±10.95 | 5.43±5.67 |
| Crude fibre (%) | 3.30±0.60 | 2.90±0.36 |
| Acidity (%) | 0.63±0.31 | 5.49±0.96 |

### 3.2 Physico-chemical composition of low calorie desserts

#### 3.2.1 Moisture content

Moisture content of different combination of low calorie desserts as determined by (AOAC, 1990) [5]. The Highest Percentage of moisture (76.38) was recorded in C1S1 and followed by C1S2 (74.27), C1S3 (72.46), C1S4 (70.21), C2S1 (75.40), C2S2 (74.35), C2S3 (71.78), C2S4 (70.59), C3S1 (74.49), C3S2 (72.56), C3S3 (70.41), C3S4 (68.30), C4S1 (72.30), C4S2 (70.41), C4S3 (68.20), C4S4 (66.30). In most of the treatment combinations moisture content differed significantly.

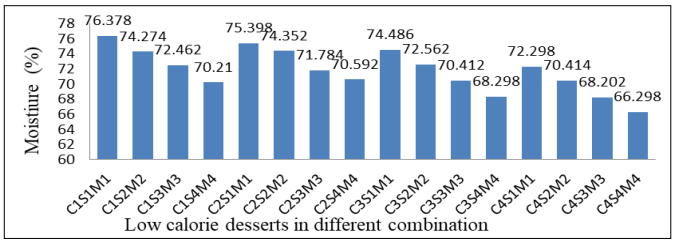


**Fig 2:** Moisture content of low calorie desserts

#### 3.2.2 Total ash content

The ash value is a measure of the amount of added minerals. Natural ash content is due to the minerals like calcium, phosphorus and iron. Ash content of a foodstuff represents inorganic residue remaining after destruction of organic matter (Ranganna, 1986). In the present study The Highest Percentage of Ash (1.72) was recorded in C2S4, and followed by C1S1 (1.09), C1S2 (1.22), C1S3 (1.32), C1S4 (1.39), C2S1 (1.59), C2S2 (1.64), C2S3 (1.72), C3S1 (1.31), C3S2 (1.42), C3S3 (1.42), C3S4 (1.54), C4S1 (1.49), C4S2 (1.54), C4S3 (1.61), C4S4 (1.61). In most of the treatment combinations Ash content differed significantly.

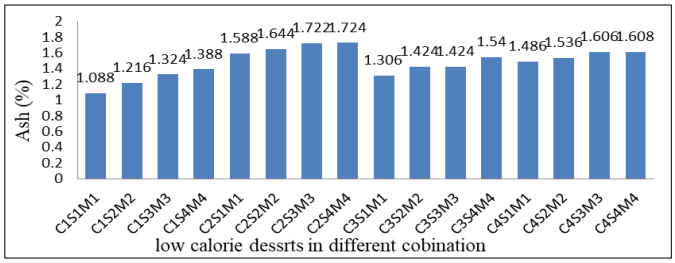


**Fig 3:** Ash content of low calorie desserts

#### 3.2.3 Crude protein content

The Highest Percentage of protein (8.92) was recorded in C4S4 and followed by C1S1 (5.33), C1S2 (5.57), C1S3 (5.82), C1S4 (5.92), C2S1 (6.45), C2S2 (6.54), C2S3 (6.63), C2S4 (6.78), C3S1 (7.23), C3S2 (7.29), C3S3 (7.38), C3S4 (7.48), C4S1 (8.30), C4S2 (8.53), C4S3 (8.66). In most of the treatment combinations protein content differed significantly.

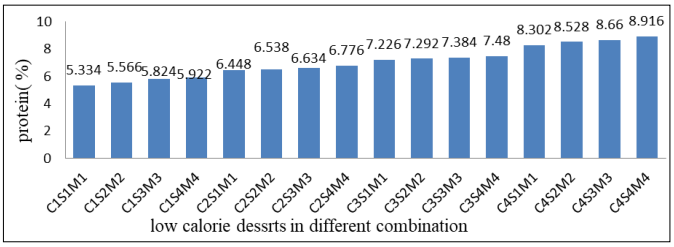


**Fig 4:** Protein content of low calorie desserts

#### 3.2.4 Fat content

The Highest Percentage of Fat (0.27) was recorded in C1S4 and followed by C1S1 (0.20), C1S2 (0.25), C1S3 (0.26), C2S1 (0.21) C2S2 (0.22), C2S3 (0.23), C2S4 (0.24), C3S1 (0.22), C3S2 (0.23), C3S3 (0.24), C3S4 (0.25), C4S1 (0.18), C4S2 (0.20), C4S3 (0.21), C4S4 (0.24). In most of the treatment combinations fat content differed significantly.

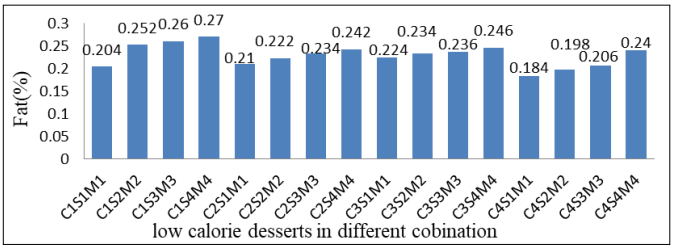


**Fig 5:** Fat content of low calorie desserts

#### 3.2.5 Titratable acidity

Titratable acidity studied to ensure physico-chemical changes during preparation. The Highest percentage of acidity (1.15) was recorded in C1S4 and followed by C1S1 (0.36), C1S2 (0.56), C1S3 (0.85), C2S1 (0.36) C2S2 (0.67), C2S3 (0.87), C2S4 (1.14), C3S1 (0.21), C3S2 (0.25), C3S3 (0.26), C3S4 (0.28), C4S1 (0.22), C4S2 (0.22), C4S3 (0.27), C4S4 (0.28). In most of the treatment combinations acidity content' differed significantly. As per the Indian Standards, acidity of ice cream should not be more than 0.25 per cent.

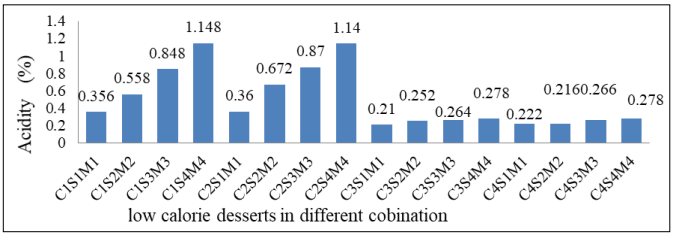


**Fig 6:** Acidity content of low calorie desserts

#### 3.2.6 Energy (Kcal)

The Highest kcal of Energy (129.58) was recorded in C4S1 and followed by C1S1 (91.16), C1S2 (99.30), C1S3 (106.16),

C1S4 (114.96), C2S1 (93.11), C2S2 (97.13), C2S3 (107.15), C2S4 (111.95), C3S1 (97.95), C3S2 (105.23), C3S3 (113.84), C3S4 (121.88), C4S2 (105.78), C4S3 (113.19), C4S4 (121.80). In most of the treatment combinations energy Content differed significantly.

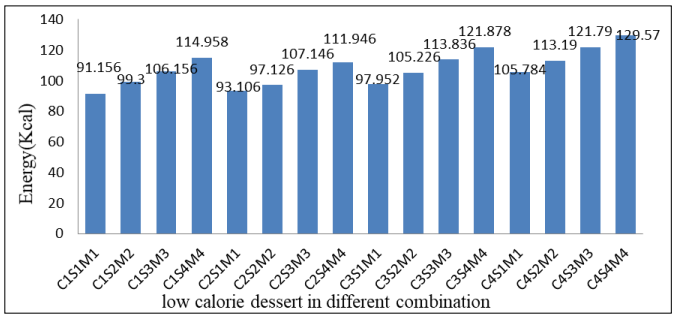


**Fig 7:** Energy of low calorie desserts

### 3.2.7 Crude fibre content

The Highest percentage of Fibre (2.22) was recorded in C4S4 and followed by C1S1 (0.69), C1S2 (1.08), C1S3 (1.51), C1S4 (1.85), C2S1 (1.24), C2S2 (1.32), C2S3 (1.36), C2S4 (2.20), C3S1 (0.86), C3S2 (1.26), C3S3 (1.65), C3S4 (2.05), C4S1 (1.02) C4S2 (1.44), C4S3 (1.83). In most of the treatment combinations fibre content' differed significantly.

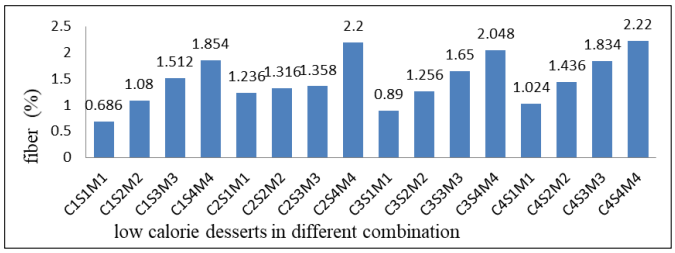


**Fig 8:** Fiber content of low calorie desserts

### 3.2.8 Carbohydrates content

The Highest Percentage of Carbohydrates (22.94) was recorded in C4S1 and followed by C1S1 (17.00), C1S2 (18.69), C1S3 (20.13), C1S4 (22.21), C2S1 (16.36), C2S2 (17.24), C2S3 (19.63), C2S4 (20.67), C3S1 (16.79), C3S2 (18.49), C3S3 (20.54), C3S4 (22.44), C4S2 (17.73), C4S3 (19.32), C4S4 (21.33). In most of the treatment combinations Carbohydrates' content differed significantly**.**

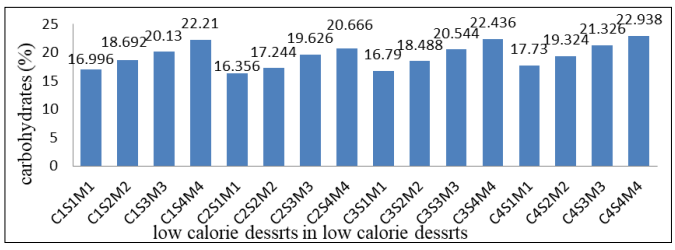


**Fig 9:** Carbohydrates content of low calorie desserts

### 3.2.9 pH value

The Highest pH of (5.47) was recorded in C1S1 and followed by C1S2 (5.22), C1S3 (4.48), C1S4 (4.34), C2S1 (5.21), C2S2 (4.36), C2S3 (4.26), C2S4 (4.19), C3S1 (5.43), C3S2 (5.15), C3S3 (4.61), C3S4 (4.43), C4S1 (5.25), C4S2 (4.60), C4S3 (4.34), C4S4 (4.27)**.** In most of the treatment combinations pH differed significantly.

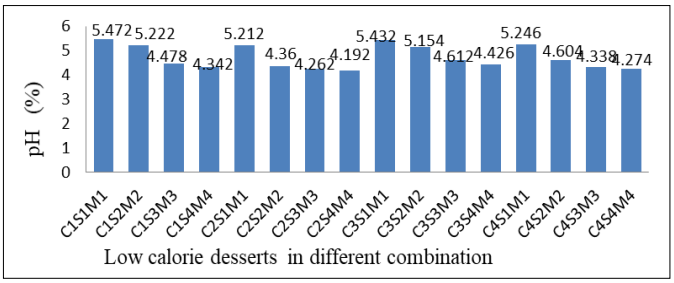


**Fig 10:** pH of low calorie desserts

### 3.2.10 Total Soluble Solids content

The Highest TSS of (23.61) was recorded in C4S1 and followed by C1S1 (23.46), C1S2 (22.31), C1S3 (16.32), C1S4 (15.26), C2S1 (23.36), C2S2 (22.32), C2S3 (17.21), C2S4 (15.24), C3S1 (23.54), C3S2 (22.45), C3S3 (18.37), C3S4 (16.35), C4S2 (16.33), C4S3 (15.33), C4S4 (15.24). In most of the treatment combinations TSS' differed significantly.

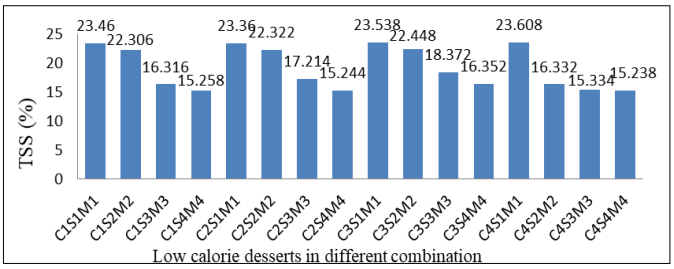


**Fig 11:** TSS of low calorie desserts

## 4. Conclusion

The developed product namely dietetics dessert is a low calorie, low fat, low protein and fibrous product and less energy which is having the potential to relieve the constipation, controlling the heart disease and diabetes mellitus along with lowering the high blood pressure. The overall fat content had an effect on the % fat, Protein, ash, total solids, moisture, and % moisture in fat-free substances, % total carbohydrates and energy values. The fat content played a major role in desserts. The pH and % titratable acidity decreased with an increase in the % fruit pulp added due to the higher pH of the fruit pulp. It can also be concluded that the fat effect on the % TA. The fruit pulp in the desserts affected the overall physicochemical properties,

As a result, a novel culinary concept for creating desserts addition of custard apple, strawberry pulp and sugar has been developed. Custard apple and strawberry are some examples of products from the fruits kingdom that with the right combination of aromas and textures could be the key ingredients for the elaboration of natural and healthy desserts. This is conclude that prepared low calorie desserts are very beneficial and useful for the heart patient, diabetics patients. This dessert can put into the Patients died chart.

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