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# Development and quality assessment of fruity flavored yoghurt using muskmelon

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**Abstract**
Yoghurt is one of the major heat fermented indigenous milk product, which is gaining more popularity in modern societies of the developing countries. It contains milk solids in a fourfold concentration, its food and nutritive value is very high. Muskmelon is tropical fruits with good perishable commodities and important ingredients in human dietaries. The basic aim of study was to find out the quality parameters of Yoghurt prepared by addition of Muskmelon at different level of concentration (*i.e.* $T_0$, $T_1$, $T_2$ and $T_3$) using Cow milk. The concentration of Muskmelon in experimental samples was 5 % for treatment $T_1$; 10 % for treatment $T_2$ and 15% for treatment $T_3$ respectively. While control sample T0 was prepared from 100% of Cow milk. The concentration of sugar was 8.5% which was constant for all the treatments and gelatin was 0.4% in treatments (*i.e.* $T_1$, $T_2$ and $T_3$). The data collected on different aspects were tabulated and analyzed statistically using the methods of analysis of variance and critical difference. Physicochemical analysis (protein, fat, total solids, moisture, ash, acidity and carbohydrate) was done for estimating its nutritional content and organoleptic characteristics (flavor and taste, body and texture, colour and appearance, and overall acceptability) were judged by panel on 9 point hedonic scale. Overall acceptability score for treatments $T_0$, $T_1$, $T_2$ and $T_3$ were 7.9, 7.8, 8.1 and 7.1 respectively. The cost of production of final product for treatments T0, T1, T2 and T3 were 51.03, 52.25, 51.40 and 50.55 Rs. / Kg respectively. According to the analysis, treatment $T_2$ with 10 % Muskmelon was found to be the best among all. Thus, product acceptability judged by organoleptic evaluation and therapeutic value, the treatment can be rated as $T_2>T_0>T_1>T_3$.

**Keywords:** Milk, muskmelon (*Cucumis melo* L), yogurt, fruit yogurt

## Introduction
Nature designed milk as food for the young. Thousands of years ago, mankind learned of the possibilities of both milk and milk products as food not only for the young but also for adults. Accordingly, through selection and breeding, man has greatly increased the milk-producing function of those animals best adopted as a source of milk and has used milk of many animals for his own food (Bauman and Davis, 1974) [5].

Yoghurt is a popular and beneficial fermented milk product obtained from the milk or the milk products by the lactic acid fermentation through the action of *Streptococcus salivarius* subsp. *thermophilus, Lactobacillus delbrueckii* subsp. *bulgaricus*. When a sufficient quantity of lactic acid is produced then the milk coagulates and this coagulated milk is called yoghurt. Yoghurt has more profits than milk. Digestive system in some of people has an allergy to lactose (sugar of milk), but lactose is transformed to lactic acid in yoghurt and does not create allergy. On the other hand, calcium of yoghurt is absorbed in body faster than milk because, lactic acid of yoghurt turns calcium into solution and absorption. Therefore, yoghurt devotes calcium to body more than milk (Ariaii p. *et al.*, 2011) [4]. There are two major types; set and stirred yogurt. The main manufacturing procedure of these types of yogurts. Set yogurt (which includes fruit-on-the bottom) is formed in retail pots as lactic acid bacteria ferment lactose into lactic acid giving a continuous gel structure in the consumer container. In stirred yogurt, the acid gel formed during incubation in large fermentation tanks is disrupted by agitation (stirring), and the stirred product is usually pumped through a screen which gives the product a smooth and viscous texture (Tamime and Robinson, 1999) [14]. Yoghurt is easily digested, has high nutritional value, and is a rich source of carbohydrates, protein, fat, vitamins, calcium, and phosphorus. Because milk protein, fat, and lactose components undergo partial hydrolysis during fermentation, yoghurt is an easily digested product of milk (Sanchez *et al.*, 2000) [12]. Originally yoghurt was made from boiled concentrated whole milk, but most modern methods of manufactories use whole or partly defatted milk containing small amounts of skim milk

powder or concentrate. Yoghurt is a healthy and delicious food due to its high nutritive and therapeutic value**.** Yoghurt is valued for controlling the growth of bacteria and in curing of intestinal disease like constipation, diarrhea and dysentery**.** Bitterness in yoghurt is produced during storage due to the function of peptides caused by the proteolytic activity of *Lactobacillus bulgaricus* (Renz and Puhan, 1975) **[10].** The acidity of yoghurt varies from 0.7 to1.1% lactic acid with pH approximately 4.0 to 4.2 (Wanda and Salauen, 2005). Yoghurt is more nutritive than milk in vitamin contents for its digestibility. It is also used as sources of calcium and phosphorous (Foissy, 1983) [7]. It is believed that yoghurt has valuable "therapeutic properties" and helps in curing gastrointestinal disorders (Adolfsson. 2004) [2].

There has been a significant rise in the popularity of yogurt in recent years. In North America, the purchase of probiotic yogurts grew from 11% in 2006 to 19% in 2008 while in Europe between 2002 and 2007, yogurt consumption equally grew by 13% in Western Europe and 18% in Eastern Europe (Granato and Branco *et al.*, 2010) [8]

**Nutritional composition of yoghurt**

| | Milk | | Yogurt | | |
|---|---|---|---|---|---|
| | **Full cream** | **Skimmed** | **Full cream white** | **Skimmed white** | **Full cream fruit** |
| Dry residual% | 12.5 | 9.5 | 15 | 14 | |
| Protein % | 3.3 | 3.4 | 4.3 | 6.7 | 4.3 |
| Fat % | 3.4 | 0.2 | 4.1 | 0.2 | 4.5 |
| Total sugar % | 4.8 | 5.0 | 4.6 | 4.9 | 15.7 |
| Lactic acid % | 0.003 | 0.003 | 0.5 | 0.5 | 0.5 |
| Energetic value, kcal/100 | 62 | 35 | 66 | 47 | 102 |

Average composition and energetic percentage value of cow's milk and some types of yoghurt (Agro scope Composition 2007; Agricultural Research Service 2013) Fruits and vegetables are cheaper and better source of the protective foods, if they can be supplied in fresh (or) preserved form throughout the year for human consumption, the national picture will improve greatly (Srivastava, 2002) [13]**.** Muskmelon is known as dessert vegetable and native of tropical Africa in the state of Sahara desert, it is commonly known as Cantaloupe in USA. Amongst the popular fruits, muskmelon is also a commercial fruit of considerable importance in the states of Punjab, Karnataka, Andhra Pradesh and Maharashtra. It is a summer fruit both for rich and poor. Muskmelons are valued for their sweet taste, pleasant flavour and attractive appearance (Bhatia *et al*., 1968) [6]. Muskmelon (*Cucumis melo L*) is a representative of cucumber (Cucurbitaceous) family. Muskmelon is a delicious fruit of common man and its fruit pulp and juice are used in refreshing drinks. Fruit pulp contains 90-94% water, 5% carbohydrates, 1% protein, 3420 IU of vitamin A and 33 mg vitamin C (Anonymous, 2002, Rashid and Mahmood, 2004) [3, 11]. Its flesh and seeds have high nutritive value. Besides, muskmelon is a rich source of vitamins A, C, E, cucurbitacin B, beta-carotene and folic acid, together considered as phytonutrients or phytochemicals (Adams and Richardson., 1981) [1]. *Cucumis melo*, in addition to its superior consumer preference, is an extremely healthful food choice as they are rich in ascorbic acid, carotene, folic acid, and potassium as well as a number of other human health-bioactive compounds (Lester and Hodges, 2008) [9].

**Nutritional Value of Musk Melon/Cantaloupe in a 100 gm**

| | |
|---|---|
| Fat, g | 0.2 |
| Protein, g | 0.3 |
| Carbohydrate, g | 3.5 |
| Moisture, g | 95.2 |
| Ash, g | 0.4 |
| Fiber, g | 0.4 |
| Vitamin C, mg | 26 |
| Thiamin, mg | 0.11 |
| Riboflavin, mg | 0.08 |
| Niacin, mg | 0.3 |
| Iron, mg | 1.4 |
| Calcium, mg | 32 |
| Phosphorus, mg | 14 |
| Total carotene, µg | 169 |
| Energy, Kcal | 17 |

Nutritive value of Indian foods. 2002. S no 280 (ref # 2). Code: 2289

## Method and Materials

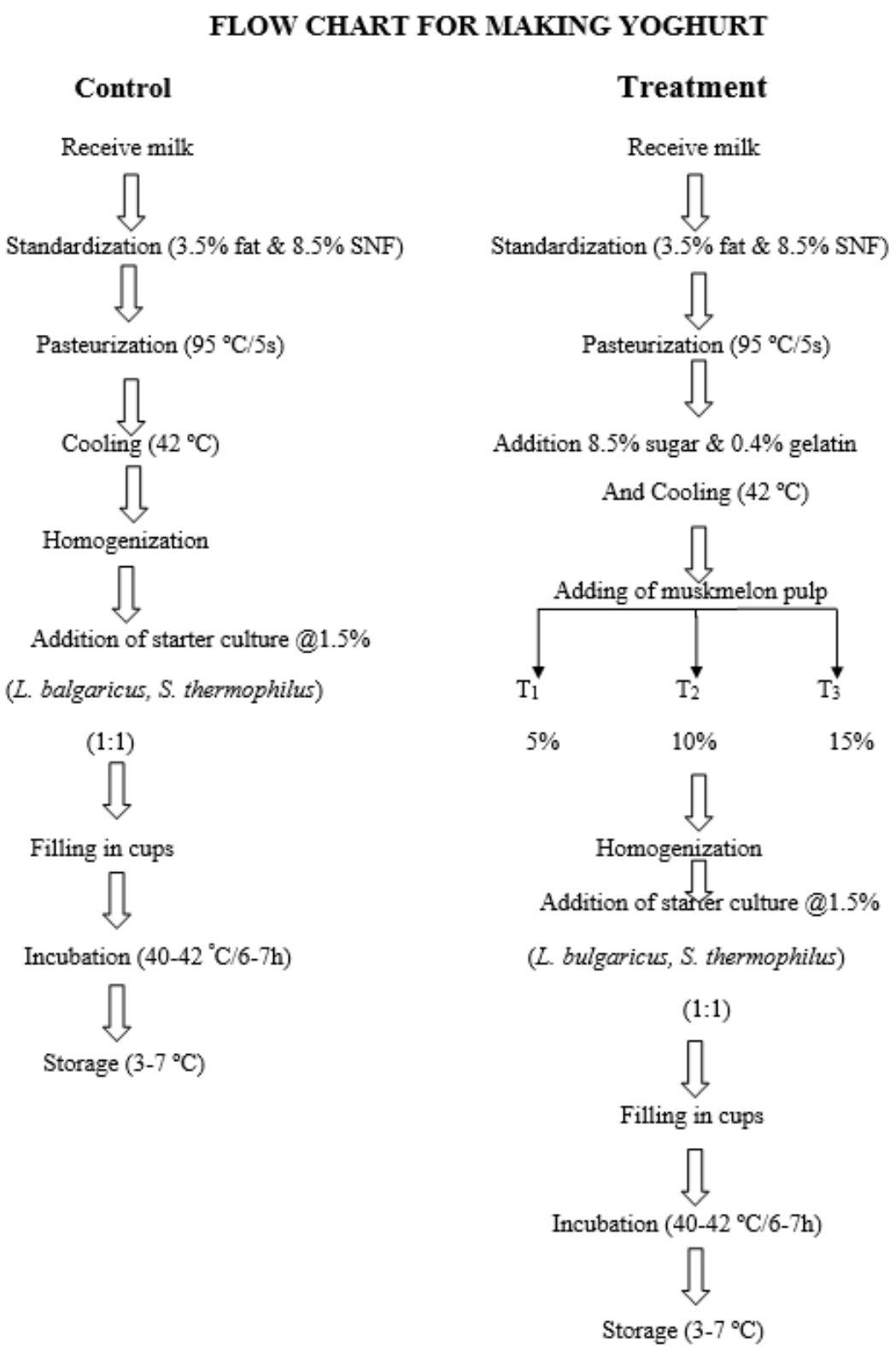
The experiment "Development and Quality Assessment of Fruity Flavored Yoghurt Using Muskmelon" was carried out in the research lab of "Cytogene Research & Development" B- Block Chauraha, Indra Nagar, Lucknow, UP. India – 226016. Starter culture was purchased from NDRI karnal and milk, Muskmelon, Sugar, Gelatin was collected from local market of Lucknow. Four treatment samples were studied and each treatment was replicated five times. In all 20 samples were studied. The controlled experiment of yoghurt with muskmelon was tested and statistically analyzed. The details of experimental techniques was employed during the course of present investigation was studied under the following headings.

1. Material required for preparation of control and experimental Yoghurt.
2. Procurement and collection of ingredients.
3. Preparation of treatments.
4. Analysis of developed product.

a) Chemical analysis
b) Microbial analysis
c) Sensory Analysis
d) Cost Analysis

**Treatment combination (Ratio)**

| Treatment | Milk | Muskmelon | Sugar | Gelatine |
|---|---|---|---|---|
| To | 100 | _ | 8.5 | _ |
| $T_1$ | 95 | 5 | 8.5 | 0.4 |
| $T_2$ | 90 | 10 | 8.5 | 0.4 |
| $T_3$ | 85 | 15 | 8.5 | 0.4 |




**Preparation of Muskmelon yoghurt**

Fresh and acceptable quality of Collected Muskmelon (*Cucumis melo L*) fruits were washed with clean water and peeled manually. Then the seeds were removed and the Muskmelon pieces were blended. Cow milk obtains with 3.5% fat level and 8.5% SNF. Milk was pasteurized and heated to 90˚C for 5 Sec. Sugar (8.5%) and gelatin (0.4%) were added to milk and mixed well. Heated milk was divided into four equal portions; one portion for control and the other three portions for the experiment. Water melon pulp was added to the experimental milk samples at 5%, 10%, and 15% levels. Commercial yogurt starter culture 1.5% containing 1:1 ratio of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* was inoculated to the mixture. Prepared mixtures were incubated at 42 ˚C for 6-7 hours and stored at 4 ˚C after incubation.

**Physico-chemical analysis**

The moisture of treatment samples was determined by procedure described in sp: 18 (part 11)1981. Fat was estimated by using Soxhlet Apparatus method given in SP (part 11)-1981. Thereafter, the fat is extracted with diethyl

ether and petroleum ether. The mixed ethers are then evaporated and the residue weighed. Total nitrogen/protein of yoghurt was determined by Semi Micro Kjeldahl method SP (part 11)-1981. Ash content estimated by using muffle furnace as per the procedure given in SP: 18 (part11)-1981. The acidity of yoghurt was obtained by method described in sp 1479, (part: 1) 1960. Carbohydrate content was calculated by differential method in (IS: 1050, 1983).

**Sensory analysis**

The samples were subjected to sensory evaluation as described in using a 9 point hedonic scale score card.

**Microbiological analysis**

All the yoghurt samples were analyzed for the Yeast and Mold Count (YMC) and Coliform Count by the methods as described in IS: 1947 (Part -III).

**Result and Discussion**

The investigation was based to prepare "Development and Quality Assessment of Fruity Flavored Yoghurt Using Muskmelon" The data collected on the different aspects were tabulated and analyzed statistically using the method of analysis of variance and critical difference technique. The significant and non-significant differences observed have been analyzed critically within and between the treatment combinations.

The obtained result from the analyzed data is presented in this chapter under the following headings:

- Chemical characteristics of fruit yoghurt
- Organoleptic characteristics of fruit yoghurt
- Microbiological characteristics of fruit yoghurt

**Table 1:** Average data for different parameters of control and experimental units

| Parameters | Scores/ values based on mean value of different parameters of treatments | | | | CD Values |
|---|---|---|---|---|---|
| | Chemical analysis in percent | | | | |
| Treatment | $T_0$ | $T_1$ | $T_2$ | $T_3$ | |
| Fat | 3.442 | 3.304 | 3.116 | 2.988 | 0.07 |
| Protein | 3.296 | 3.104 | 2.932 | 2.798 | 0.10 |
| Moisture | 83.422 | 84.19 | 84.71 | 85.12 | 0.09 |
| Carbohydrate | 9.162 | 8.578 | 8.25 | 7.95 | 0.09 |
| Ash | 0.68 | 0.818 | 0.988 | 1.142 | 0.10 |
| Total solids | 16.58 | 15.81 | 15.29 | 14.88 | 0.06 |
| Acidity | 0.614 | 0.706 | 0.81 | 0.838 | 0.07 |

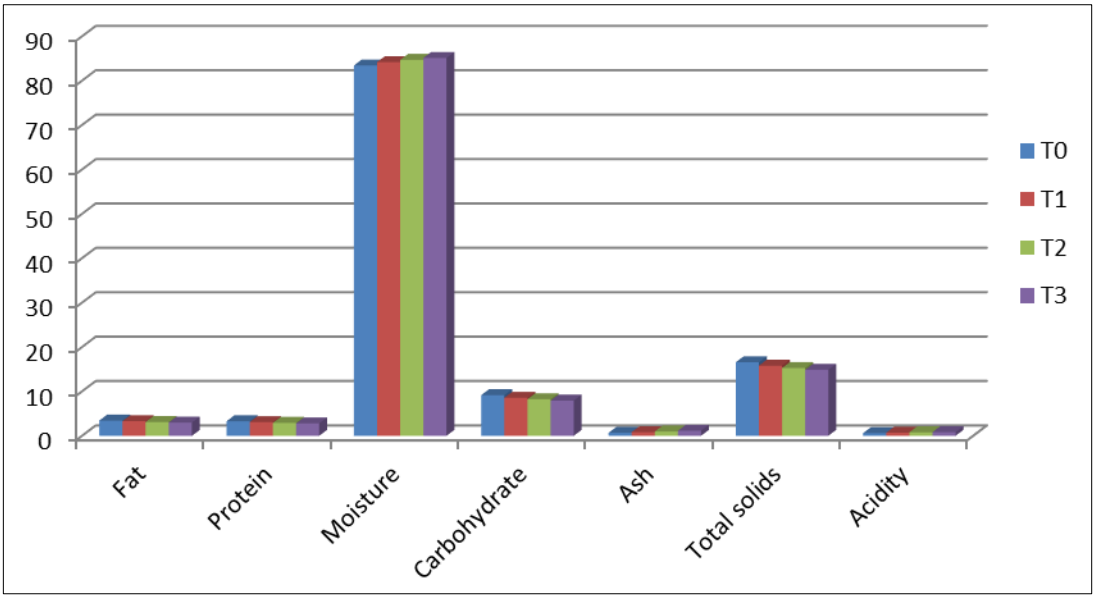



**Fig 1:** Average data for different parameters of Chemical analysis in percent experimental units

**Table 2:** Microbiological scores cfu/gm

| Yeast &mould (cfu/gm) | 5.2 | 5.8 | 6.4 | 7.2 | 1.28 |
|---|---|---|---|---|---|
| Coliform | Nil | Nil | Nil | Nil | Nil |

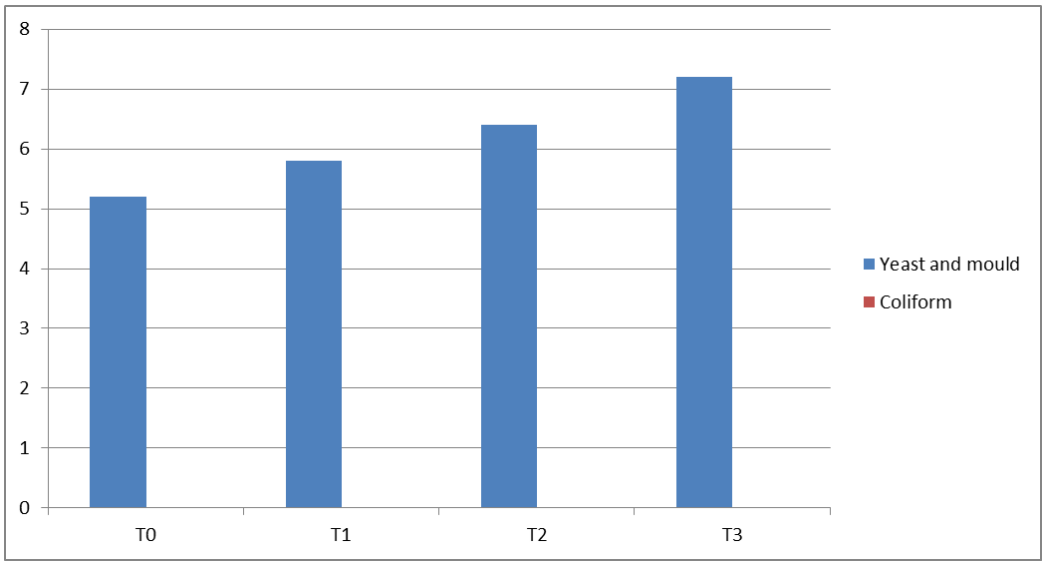



**Fig 2:** Average data for different parameters of Microbiological scores cfu/gm experimental units

**Table 3:** Organoleptic scores

| **Color & appearance** | 7.9 | 7.7 | 8.5 | 7.4 | 0.50 |
|---|---|---|---|---|---|
| Flavor and taste | 7.8 | 8.1 | 8.4 | 7.5 | 0.51 |
| Body and texture | 8.2 | 7.6 | 7.2 | 6.9 | 0.68 |
| Overall acceptability | 7.9 | 7.8 | 8.1 | 7.1 | 0.66 |
| Cost Analysis | 51.03/Kg | 52.25/Kg | 51.40/Kg | 50.55/Kg | - |

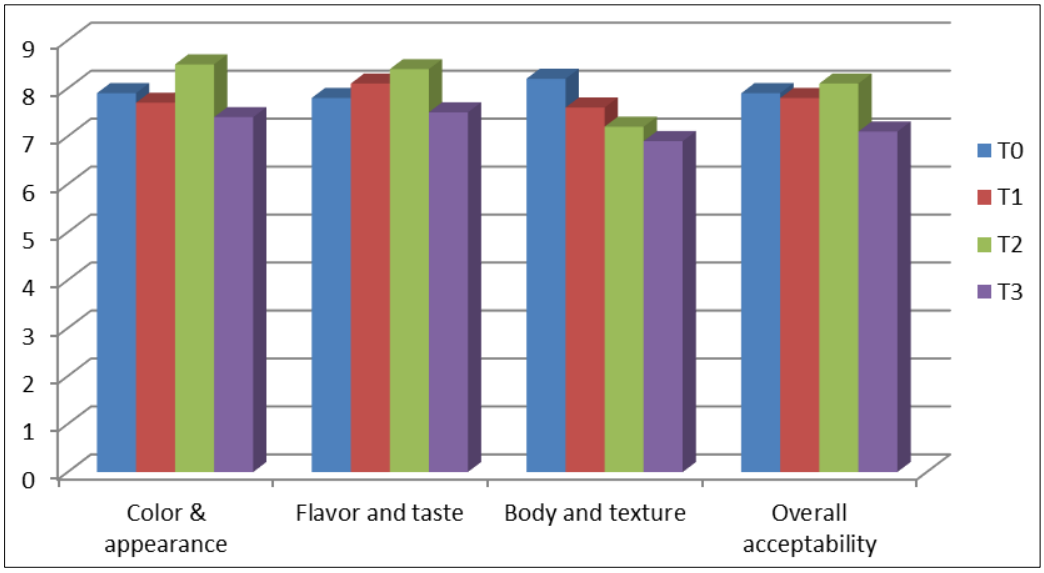



**Fig 3:** Average data for different parameters of Organoleptic scores experimental units

It is evident from the tables that Fat percent was highest (3.442) in control $T_0$ sample whereas the protein percent was highest (3.296) in the same. The increasing trend in fat and protein from $T_0$ to $T_3$. Carbohydrate percent was highest (9.162) in control sample. Ash percent was lowest (0.68) in control $T_0$ and highest (1.142) in $T_3$ containing 0.4% Muskmelon. Treatment combination $T_3$ was recorded highest for its mineral content. Moisture percent was mainly dependent upon percent Muskmelon present in treatment samples. As it was present in highest amount in Treatment $T_3$ hence its moisture percent was highest (85.12). Treatment $T_3$ recorded highest percent acidity as compared to all other samples which showed a decreasing trend from $T_3$ to $T_0$. Treatment $T_2$ (10% Muskmelon) received highest scores (8.5) for colour and appearance, (8.4) flavor and taste, and overall acceptability (8.1) on 9 point Hedonic Scale. But $T_1$ highest in body and texture (8.2). Yeast and mould count in $10^3$cfu dilution was highest in treatment samples $T_3$. Lesser count of Yeast and Mould count observed in $T_0$. Coliform counts observed were nil which demonstrate no post packaging contamination. Cost of production (Rs. Per kilogram of finished product) for experimental samples were $T_1$ (52.25), $T_2$ (51.40), $T_3$ (50.55) and that for control was $T_0$ (51.03).

## Conclusion

In view of the experimental result obtained during the present investigation, it may be concluded that Yoghurt can be successfully prepared by using Muskmelon Pulp with milk. Yoghurt with Muskmelon Pulp in treatment in $T_2$ was best in terms of organoleptic characteristics and received highest score (colour & appearance, body & texture, Flavour & taste, overall acceptability).

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