

## Effect of Storage Conditions on Quality and Shelf Life of Pumpkin Cookies

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**Abstract:** The chemical, physical evaluation and storage stability of cookies was carried out. studies on quality was based on physico-chemical analysis that is weight, diameter, thickness, spread ratio, moisture, fat, protein, ash, crude fiber, carbohydrate content as well as sensory characteristics which was determined for fresh and stored sample. The characteristics of cookies were influenced by packaging material, environmental conditions and constituents present in flour. Cookies was packed in LDPE bags and stored at room temperature. This study was conducted at the interval of 15 days up to 45days.

**Keywords:** Shelf life, Storage study, cookies, pumkin

## I. Introduction

Cookies is an American name derives from the Dutch word KOKEJE or KOEKIE which means little cake and arrived in American English through the Dutch in north America. They are characterized by a formula high in sugar and shortening and low in water. In the United States and Canada cookies is a small, flat, baked treat usually containing fat, flour and sugar. Cookies are most commonly baked until crispy or just long enough that they remain soft, but some kinds of cookies are not baked at all. Cookies are broadly classified according to how they are including at least these categories. Cookies are one of most popular bakery products made from the cereals that are consumed by school children and nearly all people. This is due to its ready-to-eat nature, convenience and availability in different varieties and affordability. Wheat as the major raw material for the production of cookies also lacks some nutrients such as amino acids especially lysine (Ihekoronye and Ngoddy, 1985). The simplicity and ease of production makes cookies the best choice as excellent carriers of a blend of different and varied functional ingredients, without obvious detractor from the sensory quality and shelf stability of the resultant products, thus, cookies can be formulated into food a product that contains all the nutrients needed by the body (Albert, 1999).

## II. Material And Methods

### Production of cookies by using Pumpkin powder in Wheat flour

The product was developed by incorporation of wheat flour and pumpkin powder. Different treatments were taken with different ratios. According to these proportions cookies were prepared for sensory parameters like colour, taste, texture, flavour, appearance, over all acceptability and after taste by trained panel members in which they found that T3 was showing highest overall acceptability. The characteristics of cookies were influenced by packaging material, environmental conditions and constituents present in flour. Cookies was packed in LDPE bags and stored at room temperature. This study was conducted at the interval of 15 days up to 45days.

### III. Results and Discussion

#### *Effect of storage on weight of developed cookies*

The weight observed for T0 was 9.97 gm on 0 day, 9.97 gm after 15 days, 9.98 gm after 30 days and 9.99 gm after 45 days. Similarly for T1 was 9.91 gm on 0 day, 9.92 gm after 15 days , 9.93 gm after 30 days and 9.93 gm after 45 days. Similarly sample T2 was 9.86 gm on 0 day 9.86 after 15 days 9.88 after 30 days and 9.88 after 45 days similarly for T3 was 9.78 gm on 0 day, 9.78 gm after 15 days 9.80 gm after 30 days and 9.81 gm after 45 days. Similarly T4 was 9.70 gm on 0 day 9.71 gm after 15 days 9.71 gm after 30 days and 9.72 gm after 45 days. It was found that during storage at ambient temperature for 45 days there were slightly increase in weight of cookies. The weight of cookies slightly increase in storage period by increasing the moisture content of cookies due to hygroscopic nature of refined flour also weight cookies increased due to other factors.

Table Effect of storage on weight of developed cookies

<b>Treatment</b>	<b>0 Days</b>	<b>15 Days</b>	<b>30Days</b>	<b>45 Days</b>
<b>T<sub>0</sub></b>	9.97	9.97	9.98	9.99
<b>T<sub>1</sub></b>	9.91	9.92	9.93	9.93
<b>T<sub>2</sub></b>	9.86	9.86	9.88	9.88
<b>T<sub>3</sub></b>	9.78	9.78	9.80	9.81
<b>T<sub>4</sub></b>	9.70	9.71	9.71	9.72

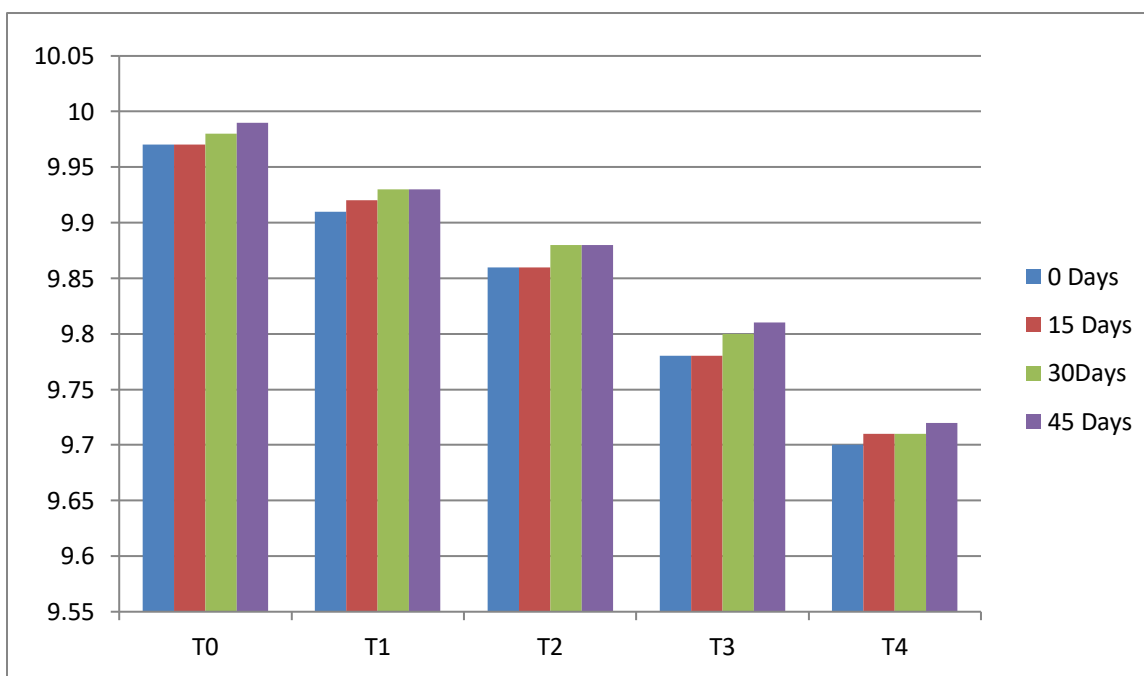


Figure: 1 Effect of storage on weight of developed cookies

***Effect of Storage on Diameter of Developed Cookies***

The diameter observed for T<sub>0</sub> was 6.8cm on 0 day, 6.8 cm after 15 days, 6.7 cm after 30 days and 6.7 cm after 45 days. Similarly for T<sub>1</sub> was 6.6 cm on 0 day, 6.6 cm after 15 days, 6.5 cm after 30 days and 6.5 cm after 45 days. Similarly sample T<sub>2</sub> was 6.3 cm on 0 day 6.3cm after 15 days 6.2 cm after 30 days and 6.2 cm after 45 days similarly for T<sub>3</sub> was 6.1 cm on 0 day, 6.1 after 15 days 6.0 cm after 30 days and 6.0 cm after 45 days. Similarly T<sub>4</sub> was 5.9cm on 0 day 5.9cm after 15 days 5.8 cm after 30 days and 5.8cm after 45 days. It was found that during storage at ambient temperature for 45 days there were slightly decrease in diameter of cookies.

**Table: 1** Effect of storage on diameter of developed cookies

<b>Treatment</b>	<b>0 Days</b>	<b>15 Days</b>	<b>30Days</b>	<b>45 Days</b>
<b>T<sub>0</sub></b>	6.8	6.8	6.7	6.7
<b>T<sub>1</sub></b>	6.6	6.6	6.5	6.5
<b>T<sub>2</sub></b>	6.3	6.3	6.2	6.2
<b>T<sub>3</sub></b>	6.1	6.1	6.0	6.0
<b>T<sub>4</sub></b>	5.9	5.9	5.8	5.8

***Effect of Storage on Thickness of Developed Cookies.***

The thickness observed for T<sub>0</sub> was 0.50 cm on 0 day, 0.52 cm after 15 days, 0.52 cm after 30 days and 0.52 cm after 45 days. Similarly for T<sub>1</sub> was 0.67 cm on 0 day, 0.67 cm after 15 days, 0.67 cm after 30 days and 0.68 cm after 45 days. Similarly sample T<sub>2</sub> was 0.65 cm on 0 day 0.66 cm after 15 days 0.66 cm after 30 days and 0.67 cm after 45 days similarly for T<sub>3</sub> was 0.64cm on 0 day, 0.64 after 15 days 0.66 cm after 30 days and 60.67 cm after 45 days. Similarly T<sub>4</sub> was 0.62 cm on 0 day 0.62 cm after 15 days 0.64 cm after 30 days and 0.65 cm after 45 days. It was found that during storage at ambient temperature for 45 days there were slightly change in thickness of cookies. Table 4.4 and figure 4.3 shows actual result the thickness of cookies was decreased average 0.25%.

**Table: 2** Effect of storage on thickness of developed cookies.

<b>Treatment</b>	<b>0 Days</b>	<b>15 Days</b>	<b>30Days</b>	<b>45 Days</b>
<b>T<sub>0</sub></b>	0.50	0.50	0.52	0.52
<b>T<sub>1</sub></b>	0.67	0.67	0.67	0.68
<b>T<sub>2</sub></b>	0.65	0.66	0.66	0.67
<b>T<sub>3</sub></b>	0.64	0.64	0.66	0.67
<b>T<sub>4</sub></b>	0.62	0.62	0.64	0.65

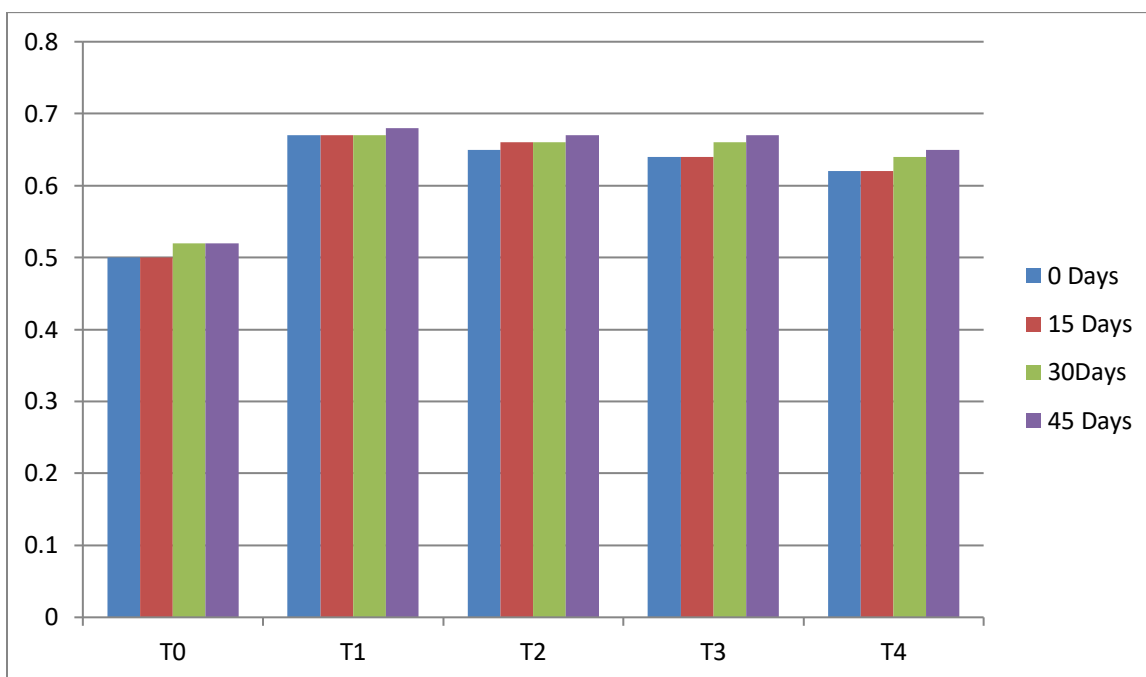


Figure: 2 Effect of storage on thickness of developed cookies.

**Effect of Storage on Spread Ratio of Developed Cookies.**

The spread ratio observed for T0 was 6.3cm on 0 day, 6.3cm after 15 days, 6.1cm after 30 days and 6.1cm after 45 days. Similarly for T1 was 6.1cm on 0 day, 6.0 cm after 15 days, 5.9 cm after 30 days and 5.8 cm after 45 days. Similarly sample T2 was 6.0 cm on 0 day 6.0 cm after 15 days 5.9 cm after 30 days and 5.8 cm after 45 days similarly for T3 was 5.8cm on 0 day, 5.8 after 15 days 5.7 cm after 30 days and 5.6 cm after 45 days. Similarly T4 was 5.7 cm on 0 day 5.6 cm after 15 days 5.5 cm after 30 days and 5.4 cm after 45 days. It was clear that there were slightly change in thickness of cookies stored at ambient temperature condition after 45 days of storage.

**Table: 3** Effect of storage on spread ratio of developed cookies

Treatment	0 Days	15 Days	30 Days	45 Days
T <sub>0</sub>	6.3	6.3	6.1	6.1
T <sub>1</sub>	6.1	6.0	5.9	5.8
T <sub>2</sub>	6.0	6.0	5.9	5.8
T <sub>3</sub>	5.8	5.8	5.7	5.6
T <sub>4</sub>	5.7	5.6	5.5	5.4

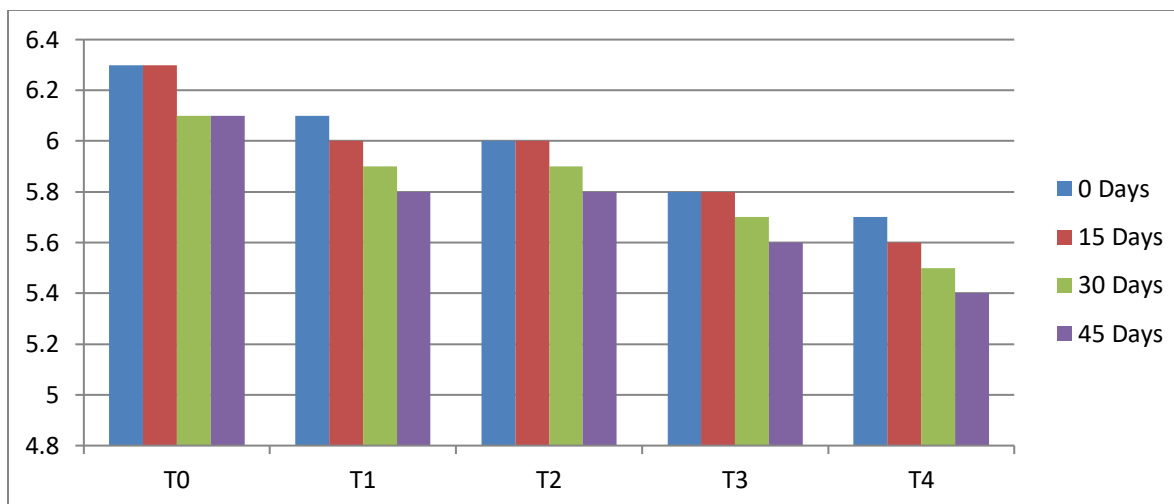


Figure: 3 Effect of storage on spread ratio of developed cookies

***Effect of Storage on Moisture Content of Developed Cookies***

The percent moisture score for sample T0 was 2.01, T1 was 2.65, T2 was 3.08, T3 was 3.28 and T4 was 3.40 on 0 days, similarly on 15 days, 30 days and 45 days shows increase in the moisture content in the sample. Wheat flour, soya flour mix as well as baking powder which are having the property of retain the moisture from environment.

**Table: 4** Effect of storage on moisture content of developed cookies.

Treatment	0 Days	15 Days	30 Days	45 Days
<b>T0</b>	2.01	2.89	3.12	3.53
<b>T1</b>	2.65	3.01	3.29	3.69
<b>T2</b>	3.08	3.25	3.56	3.98
<b>T3</b>	3.28	3.40	3.98	4.12
<b>T4</b>	3.40	3.48	3.88	4.25

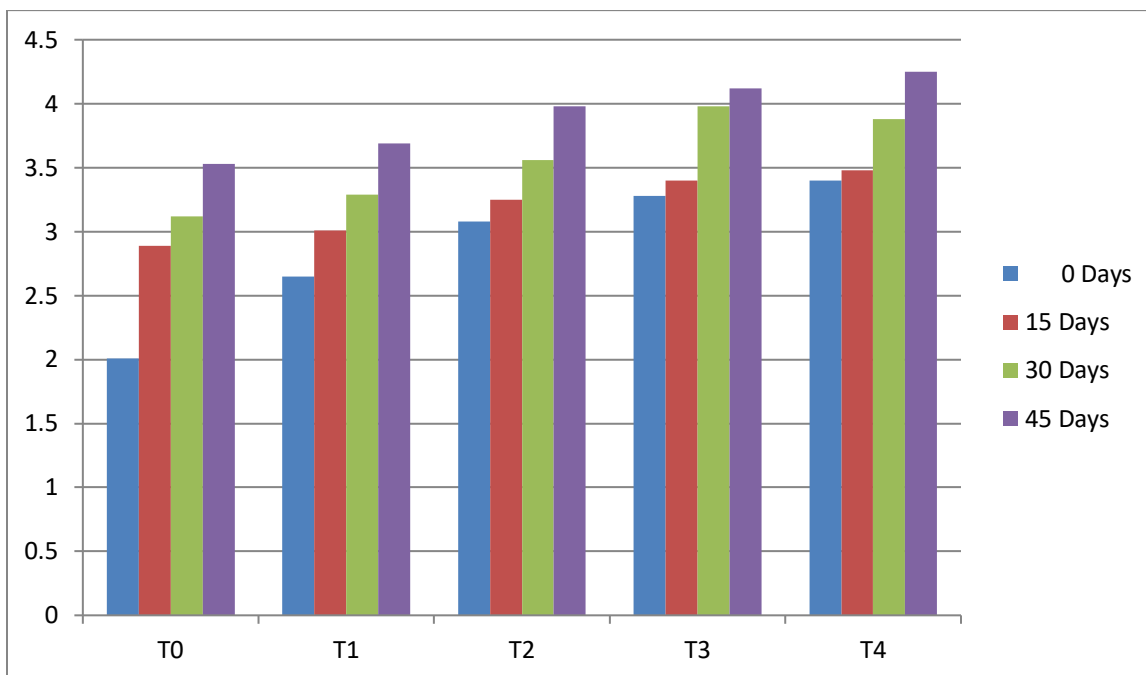


Figure: 4 Effect of storage on moisture content of developed cookies

**Effect of Storage on Ash Content of Developed Cookies**

The ash content in the food stuff represents the inorganic + matters remaining after the organic matter have been burnt. The percent ash content for sample T<sub>0</sub> was 2.35, T<sub>1</sub> was 2.56, T<sub>2</sub> was 3.29, T<sub>3</sub> was 3.56 and T<sub>4</sub> was 3.72 on 0 days, similarly for 15days, 30 days and 45 days shows slight decrease in ash content during storage. The ash content in food stuff not necessarily accounts for exactly the same composition as the mineral matter present in the original food, there may be some losses due to volatilization or some interaction between the constituent.

**Table: 5** Effect of storage on ash content of developed cookies

Treatment	0 Days	15 Days	30Days	45 Days
<b>T0</b>	2.35	2.19	2.11	2.03
<b>T1</b>	2.56	2.42	2.37	2.28
<b>T2</b>	3.29	3.22	3.07	2.97
<b>T3</b>	3.56	3.39	3.18	3.07
<b>T4</b>	3.72	3.42	3.21	3.11

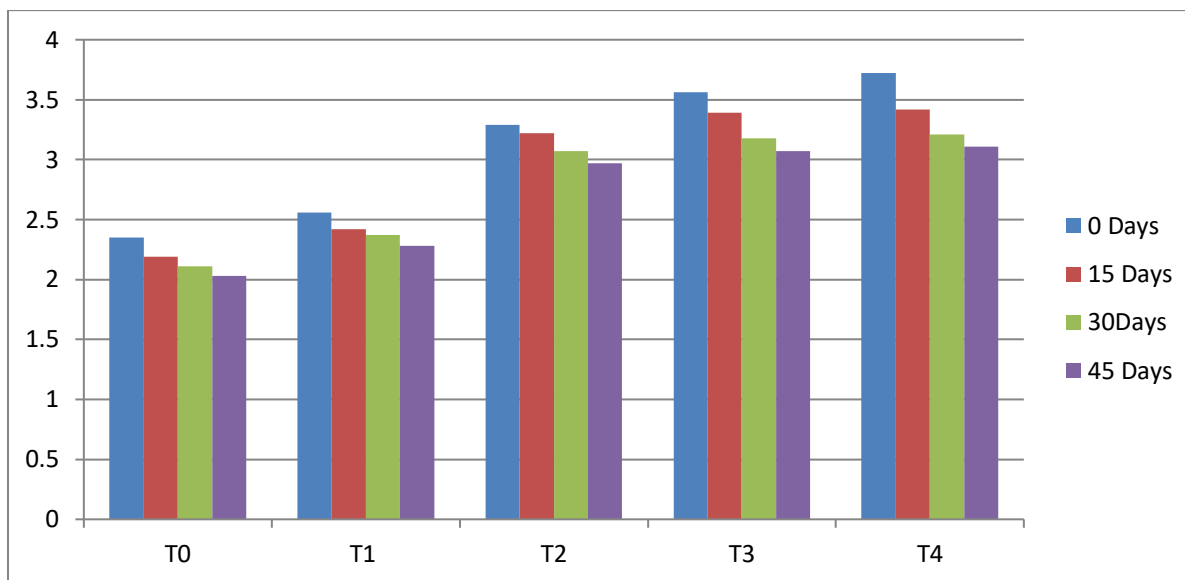


Figure: 5 Effect of storage on ash content of developed cookies

***Effect of Storage on Fat Content of Developed Cookies***

The percent fat score for sample T<sub>0</sub> was 12.03, T<sub>1</sub> was 12.05, T<sub>2</sub> was 12.59, T<sub>3</sub> was 12.93 and T<sub>4</sub> was 13.13 on 0 days and similarly on 15days, 30 days and 45 days shows slight decrease in fat content during storage. The result in present study showed that there was a significant decrease in the fat content of prepared biscuits during storage. The decrease in fat content in cookies may be attributed to the development of rancidity. The fat deterioration during storage may be the activity of lipase enzyme which split off the fat into free fatty acids and glycerol in the presence of catalyst like moisture, light and heat.

**Table: 6** Effect of storage on Fat content of developed cookies

Treatment	0 Days	15 Days	30 Days	45 Days
<b>T0</b>	12.03	12.03	12.01	11.95
<b>T1</b>	12.05	12.01	11.97	11.93
<b>T2</b>	12.59	12.56	12.54	12.50
<b>T3</b>	12.93	12.90	12.87	12.85
<b>T4</b>	13.13	13.09	13.05	13.02

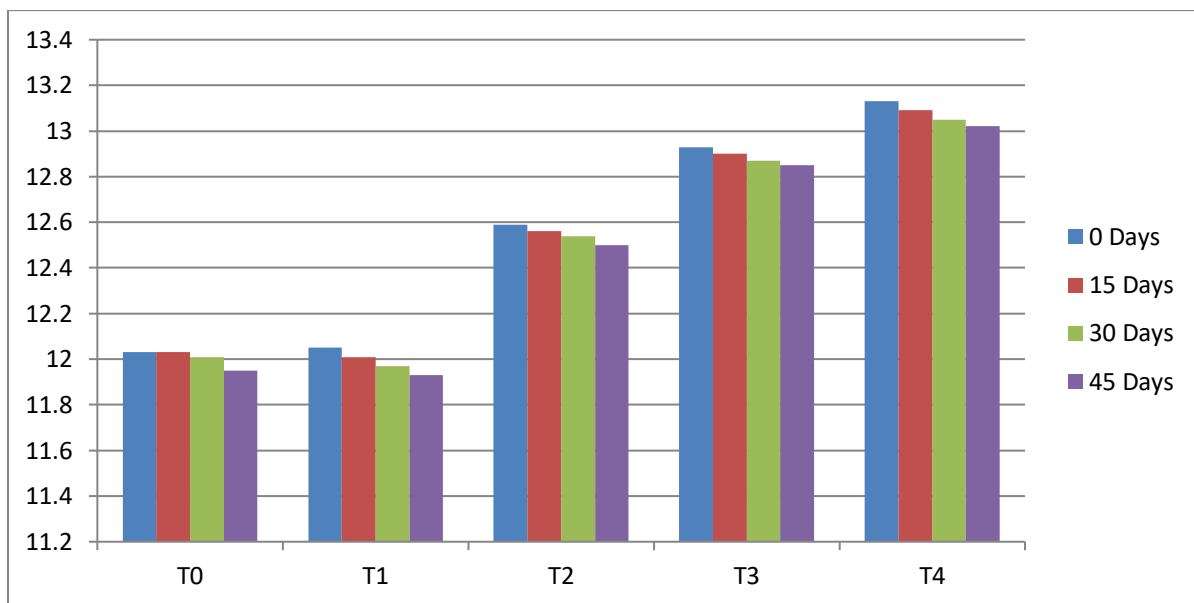


Figure: 6 Effect of storage on Fat content of developed cookies

***Effect of Storage on Protein Content of Developed Cookies***

The protein score of cookies samples T0 was 13.54, T1 was 13.76, T2 was 13.94, T3 was 14.25 and T4 was 14.46 on 0 days, similarly for 15days, 30 days and 45 days shows slight decrease in protein content during storage.

**Table: 7** Effect of storage on Protein content of developed cookies

Treatments	0 Days	15 Days	30 Days	45Days
<b>T0</b>	10.27	10.24	10.19	10.11
<b>T1</b>	11.60	11.52	11.47	11.39
<b>T2</b>	12.23	12.22	12.17	12.11
<b>T3</b>	12.93	12.86	12.81	12.78
<b>T4</b>	13.40	13.35	13.29	13.16



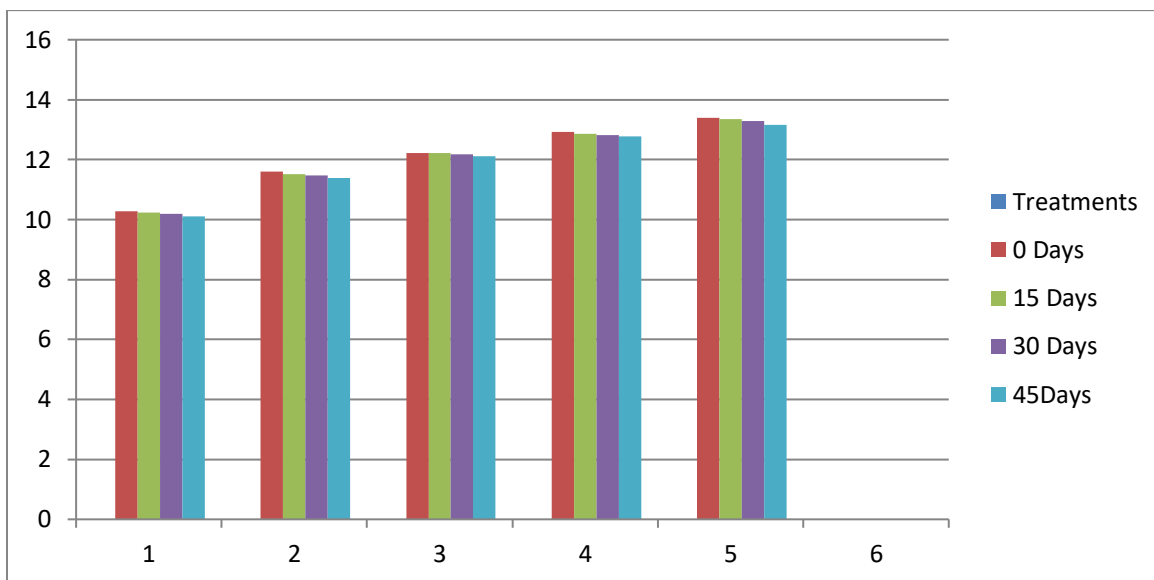


Figure: 7 Effect of storage on Protein content of developed cookies

***Effect of Storage on Crude Fiber Content of Developed Cookies***

The fibre content of samples T0 was 2.98, T1 was 3.14, T2 was 3.60, T3 was 3.95 and T4 was 4.12 on 0 days, similarly 15 days, 30 days and 45 days shows decrease in fibre content during storage.

**Table: 8** Effect of storage on crude fiber content of developed cookies

Treatments	0 Days	15 Days	30 Days	45 Days
T0	2.98	2.92	2.89	2.85
T1	3.14	3.11	3.8	3.6
T2	3.60	3.57	3.51	3.49
T3	3.95	3.93	3.89	3.83
T4	4.12	4.9	4.6	4.5

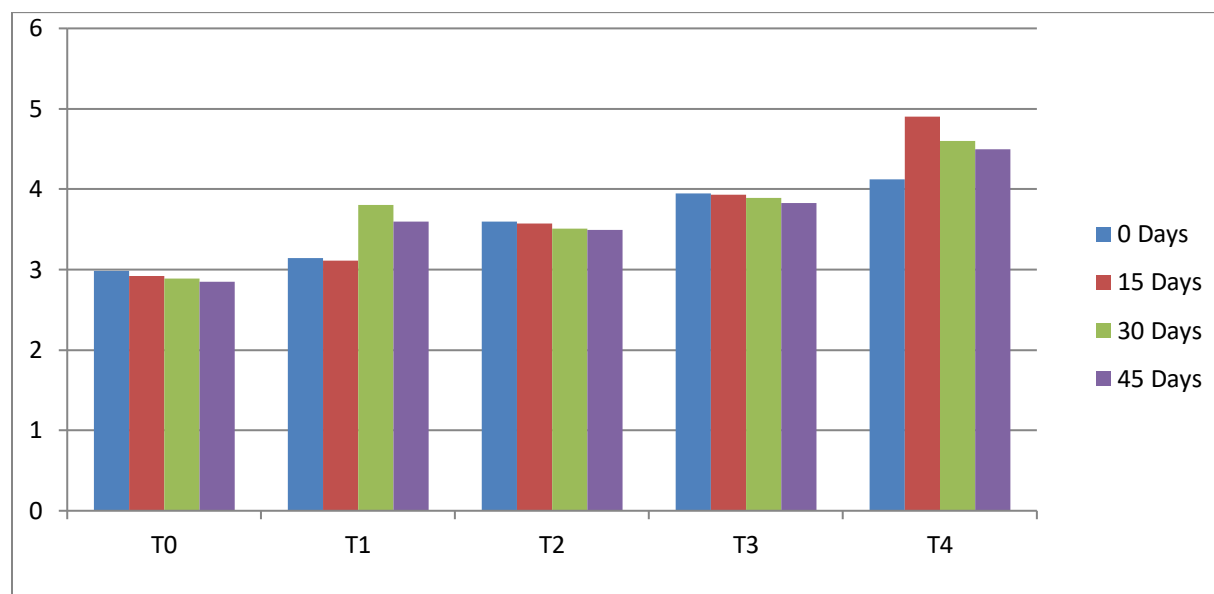


Figure: 8 Effect of storage on crude fiber content of developed cookies

#### IV. Conclusion

During the storage study the obtained data demonstrate that, the moisture content were increase from 3.08% to 3.98% fat content decrease from 12.59 to 12.50, protein content decrease 12.23 to 12.1, ash content decrease from 3.29 to 2.97, fiber content decreases 3.60 to 3.49 and carbohydrate content carbohydrate content increases 65 to 65.86 during storage period of 0 to 45 days. Also the developed cookies were analyzed for different physical parameters like weight, diameter, thickness and spread ratio in which it was found that diameter, thickness, spread ratio of the cookies were slightly decrease and the weight was increase.

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