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Research Article

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Replacement of date with stevia and maltodextrin in Iranian traditional kolompe cookie

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ABSTRACT

Today, based on the attention of consumers to nutritional properties of food, low-calorie food is highly produced and food industry has focused on re-design of traditional food besides maintaining the flavor for optimization of nutritional value. This study evaluates the physicochemical, rheological properties of Kolompe traditional cookie by date replacement with Stevia and maltodextrin. In this cookie, 15, 20, 25, 30, 35, 40, 45 and 50% of Stevia and maltodextrin were used instead of date. During 20 days of storage at temperature 25°C, the cookies texture hardiness, moisture, PH, ash, white index, L,a,b values were evaluated. In this study, 9 treatments (8 treatments with control sample) were evaluated and all tests were performed with three replications. The results showed that by increase of replacement of maltodextrin and Stevia, the sampel texture was softer, high moisture and light color were observed significantly. Treatment T8 (50% maltodextrin and Stevia) had the lowest hardness of texture and a,b values. The highest moisture, PH, ash, white index, L component during 20 days of storage at temperature 25°C was observed. Treatment T8 (50% maltodextrin and Stevia) was introduced as the best treatment. Totally, we can say 50% maltodextrin and Stevia in formulation of Kolompe cookie improved texture and qualitative properties of product in storage period.

Keywords: Kolompe, Stevia, maltodextrin

INTRODUCTION

In recent decades, low-calories food with sugar replacement content has been common to reduce energy, weight control and prevent some diseases including diabetics and high blood pressure [14]. With all advantages of sucrose as natural sweetener with great performance properties, due to its association with many problems as blood pressure, heart diseases, tooth decay, obesity and increase of glucose and insulin as harmful for diabetics and due to economic and technological issues, considerable studies have been conducted for suitable replacement of sugar with other sweeteners [7].

Various sugar replacements have been proposed to be used in different food as artificial sweeteners including Sucralose, Aspartame & Acesulfame –K and natural sweeteners as Polyol (sorbitol, manitol, xylitol, erithritol, lactitol and maltitol), Stevioside and Thaumatin [15].
Generally, due to high absorption of harmful sugar in food, drinking and wide range of food, human health is endangered and different diseases are created in the past decades. From medicine aspects, using high sugar in food leads to different chronic diseases as obesity and diabetics [10].

The increasing interest of consumers to reduction of sugar absorption increases the products with sucrose replacements. Based on the adverse effects of artificial on human health, natural sweeteners are recommended. Stevia as natural sweetener is safe, without calories in different food products [12].

EXPERIMENTAL SECTION

maltodextrin and Stevia were purchased from Salamat Mehr company and traditional Kolompe cookie treatments were provided based on Table 1.

Table 1- Treatments of study

Feature	Property	No
C	Control (32gr date)	1
T_1	15% maltodextrin and Stevia (0.015 gr Stevia+4.785gr maltodextrin +27.2gr date)	2
T_2	20% maltodextrin and Stevia (0.02 gr Stevia+6.38gr maltodextrin +25.6gr date)	3
T_3	25% maltodextrin and Stevia (0.025 gr Stevia+7.975gr maltodextrin +24.2gr date)	4
T_4	30% maltodextrin and Stevia (0.03 gr Stevia+9.57gr maltodextrin +22.4gr date)	5
T_5	35% maltodextrin and Stevia (0.035 gr Stevia+11.165gr maltodextrin +20.8gr date)	6
T_6	40% maltodextrin and Stevia (0.04 gr Stevia+12.76gr maltodextrin +19.2gr date)	7
T_7	45% maltodextrin and Stevia (0.045 gr Stevia+14.355gr maltodextrin +17.6gr date	8
T_8	50% maltodextrin and Stevia (0.05 gr Stevia+15.95gr maltodextrin +16gr date	9

Preperation of traditional Kolompe cookie

Wheat flour, oil and yolk with yeast powder and various ratios of maltodextrin and Stevia were mixed as Table 1, then milk was added. After mixture, the above dough remained for 30min. For Kolompe, mashed date with oil was added and the mentioned mixture was put at the center of Kolompe dough based on the ratios in Table 1. The above cookie was kept in oven at temperature 175℃ for 20-25 min [2]. After baking and cooling of the cookies, they were placed in poly ethylene packs and were kept at temperature 25℃ for 20 days. Physicochemical tests were performed as shown in Table 2 at 0, 10, 20 days. It is worth to mention that to make maltodextrin and Stevia equal, equation (1) is applied [6].

Equation (1):
maltodextrin =32-(32×A)/300
A: Replacement percent (15-20-25-30-35-40-45-50%)
300: Sweetness of Stevia is 300 times more than that of Sacrose [4].
100gr/32gr (content of cookie date) [2]

Table 2- Physicochemical tests

Reference	Method	Test
Binam a [2]	Using oven	Total moisture
Binam a [2]	PH meter	PH of cookie bread
Binam a [2]	Using furnace	Non-soluble ash in acid (Total cookie)
Ghandehari Yazdi et al [6]	Using texture meter	Texture
Jeli et al [3]	Image processing emthod	Color

RESULTS AND DISCUSSION

The analysis of PH results of Kolompe traditional cookies

The results showed that by increasing replacement of maltodextrin and Stevia, PH was increased. This is attributed to initial pH of maltodextrin as 5.8. By increase of replacement percent and increase of maltodextrin in formulation, PH is also increased.

Ahmadi Gavlighi et al [1] in a study evaluated the effect of replacement of liquid sugar of date with invert sugar in layered cake and stated that by the increase of liquid sugar of date, pH was decreased. In the present study, control sample had 100% date and lowest pH and by reduction of date and increase of maltodextrin and Stevia, pH was increased.

Vatankhah et al [8] evaluated the production of diet biscuit by Stevioside and stated that the increase of percentage of Stevioside in biscuit formulation, pH of product was increased significantly and it is consistent with the present study.

The increase of pH of Kolompe cookies over time is due to the reduced moisture and low aquatic activity of samples during storage and reduction of fat auto-oxidation in Kolompe cookies [11]. Also, the increase of pH is assigned to the non-enzymatic browning maillard reaction [8]. By the increase of replacement of maltodextrin and Stevia in Kolompe formulation, maillard reaction was less occurred and pH was increased. By using maltodextrin and Stevia

at different concentrations in formulation of Kolompe cookie, its pH deviation from standard value of cookie (6-7.2) during 20 storage days at temperature 25°C were not observed [2].

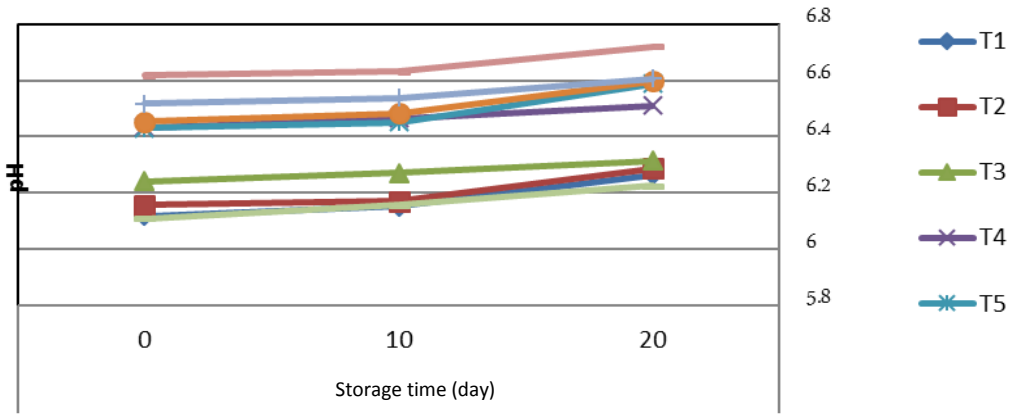

Figure 1- The pH changes of various treatments of Kolompe traditional cookies during 20 days at temperature 25°C

The analysis of results of texture of Kolompe traditional cookies

The results showed that at days 0, 10, 20, c treatment (control) had the hardest texture and treatment T8 (50% maltodextrin and Stevia) had the softest texture. The hardness of texture had direct ratio with the magnitude of imposed force [9].

Ghandehari Yazdi et al [6] evaluated the effect of sucrose replacement with Sucralose mixture with maltodextrin on rheological properties and calories of Qotab traditional cookie and reported that replacement of sugar by Sucralose and maltodextrin reduced texture hardness. The reason of hardness reduction in treatments was maltodextrin and the reason was moisture absorption of this matter. Also, the results showed that by increase of replacement of maltodextrin and Stevia, the product texture was softer. By increase of maltodextrin and Stevia replacement, water absorption was increased in Kolompe cookie and the product had soft texture.

Martínez-Cervera et al [16] in a study evaluated the Rheological,

And sensorial properties of low-sucrose muffins reformulated with sucralose/polydextrose and stated that with 50% replacement of sucrose with sucralose/polydextrose, hardness of muffins texture was reduced.

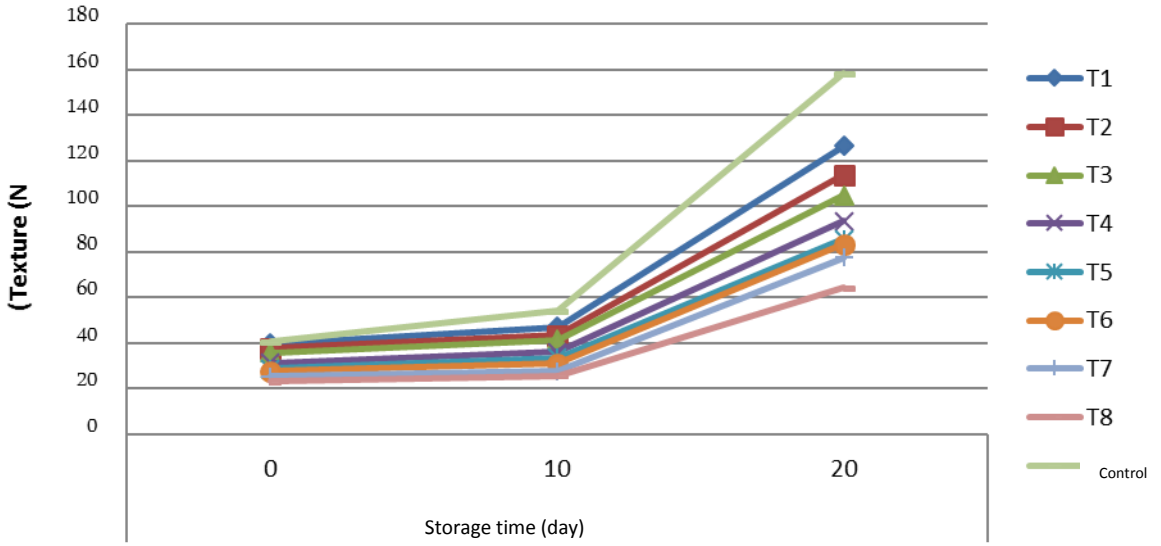

Figure 2 - The general changes of texture of various treatments of Kolompe cookies during 20 storage days at temperature 25°C

The analysis of results of moisture of Kolompe traditional cookies

The results showed that at 0, 10, 20 days of treatment storage C (control) had lowest moisture and treatment T8 (50% maltodextrin and Stevia) had highest moisture and this was due to the presence of maltodextrin in treatment

T8 and its absence in treatment C (control). maltodextrin has aquatic properties (Farzanmehr et al., 2008) and compared to raw starch has high solubility in water [6]. It is observed that by increasing replacement percent of maltodextrin and Stevia in samples, the moisture was kept highly and this is due to the presence of maltodextrin with sugars with molecular weight as absorbing moisture in product. The higher the maltodextrin as absorbing moisture in product, the higher the moisture of samples. According to the researches of Farzanmehr et al., (2008), the highest moisture is observed in the samples with maltodextrin, poly dextrose and inulin. The highest moisture in samples with high maltodextrin was reported and it showed that maltodextrin and poly dextrose in high ratio had highest moisture absorption, respectively. This is consistent with the results of present study.

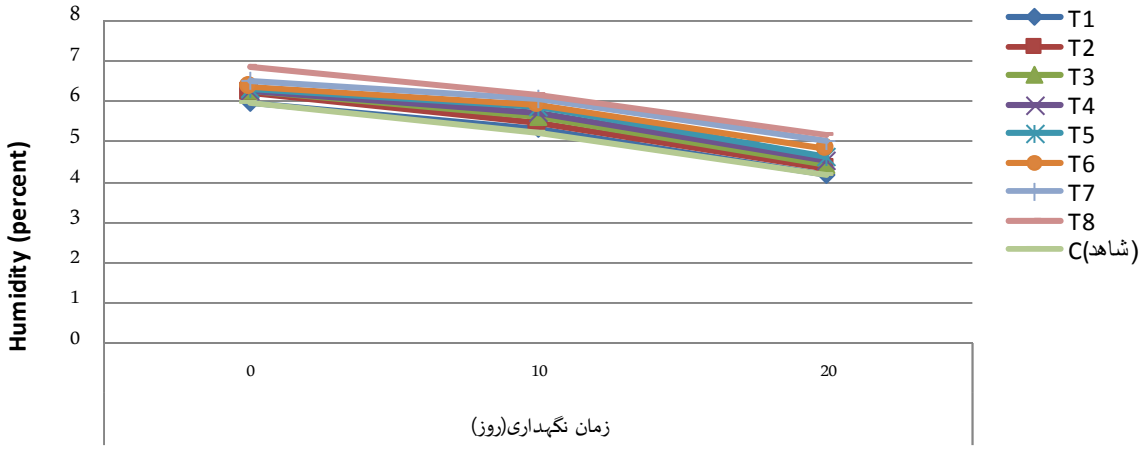

Figure 3- The general changes of moisture of various treatments of Kolompe cookie during 20 days of storage at temperature 25°C

The analysis of results of ash in Kolompe traditional cookies

The results showed that at days 0, 10, 20, storage of treatment C (control) had the lowest ash and T8 treatment (50% maltodextrin and Stevia) had highest ash. By increasing replacement of maltodextrin and Stevia, ash was increased. During storage 20 days of Kolompeh traditional cookie, the ash of samples didn't change significantly (P>0.05).

maltodextrin was used as food additive with the aim of improving gel, stability properties, texture, increasing viscosity, reduction of phase converting temperature, increasing resistance to high temperature, increase of dry matter, prevention of crystallization and control of freezing temperature [6]. Based on the feature of maltodex Control increasing dry matter, it is expected that the samples with high percent of replacement have high ashes. The prove this fact. Also, this is attributed to initial ash of maltodextrin <0.6 and by increasing replacement percent and increase of maltodextrin in formulation, ash of sample is also increased.

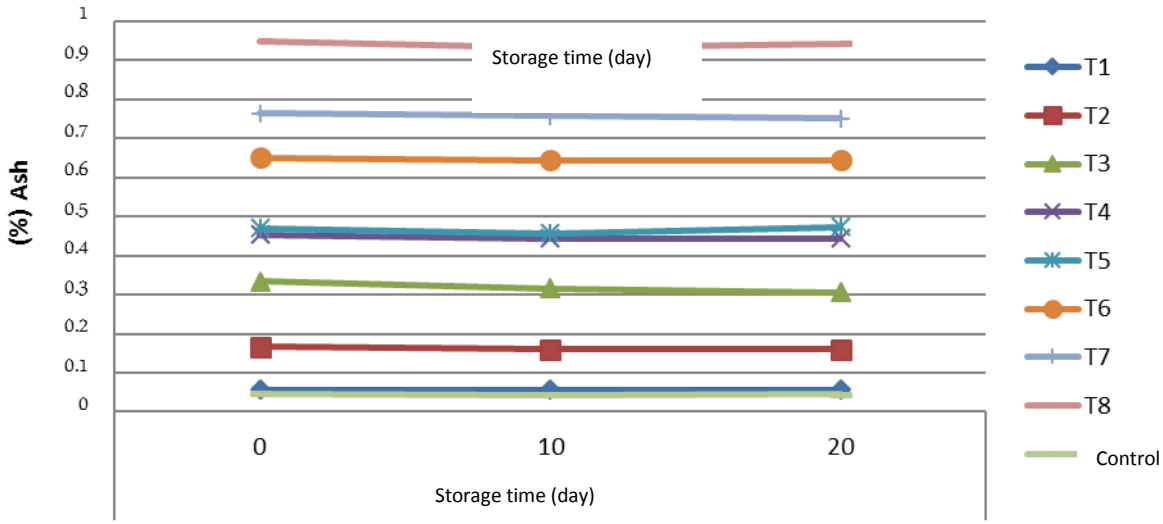

Figure 4- The changes of ash of different treatments of Kolompe traditional cookie during 20 days of storage at temperature 25°C

The analysis of results of color of kolompe traditional cookies

1- the analysis of the results of L component of kolompe traditional cookies

L value is lighting of image as ranging 0 (black) and 100 (light reflection). Based on the results, by increasing replacement percent of maltodextrin and Stevia, L or lighting was increased. In treatments, T8 treatment (50% maltodextrin and Stevia) had highest lighting (L) and treatment C (control) lowest lighting (L). Also, the results showed that L value and lighting of samples were reduced over time.

Lin and Lee [13] evaluated replacement of Sucrose with different percent of Dextrin and Sucralose in Chiffon Cake . The results showed that replacement percent was high, L value was high and cake crust was lighter than other treatments. Also, the results showed that during storage, L value was not changed and this was due to stability of *Dextrin and Sucralose composition during storage.*

Based on the lack of sugars with active carbon group (fructose and glucose) in Stevioside, this sweeter didn't participate in Maillard reaction [15]. Savitha et al [18] study on biscuit showed that light color of crust with the increase of replacement of sucrose by maltodextrin *and Sucralose mixture.*

As maltodextrin is heavy molecular poly saccharide with low external redundant groups, browning reactions (caramelization and Maillard) is less occurred [5].

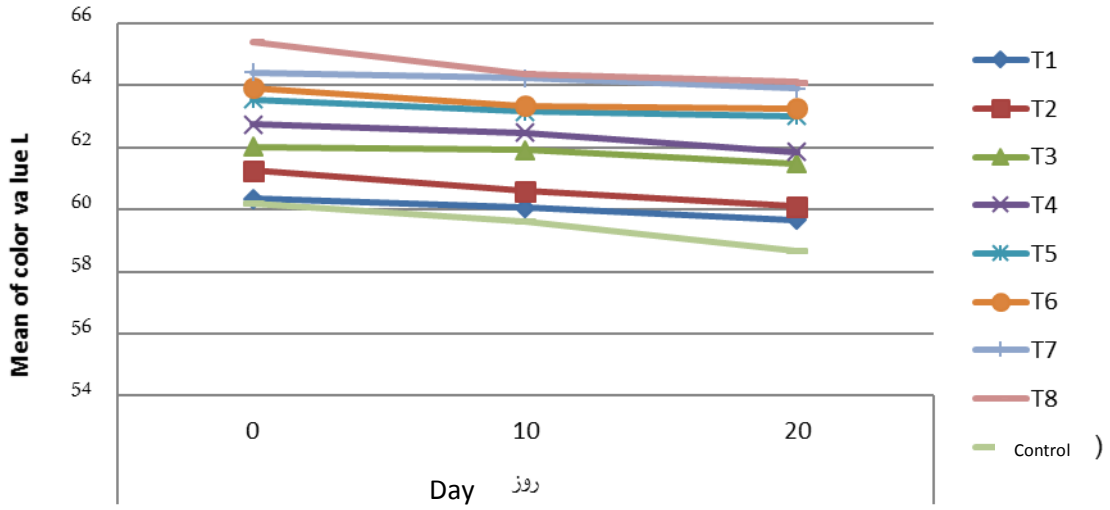

Figure 5- The changes of L component of various treatments of Kolompe cookies during different storage days at temperature 25℃

2-The analysis of results of value a of traditional Kolompe cookies

Positive values of a) were equal to Red and negative values equal to green [6]. The results showed that by increase of replacement of maltodextrin and Stevia, a) value as redness was reduced. Treatment C (control) had highest component a (high redness) and T8 treatment (50% maltodextrin and Stevia had lowest component a (Less redness). The results showed that component a) and redness didn't change significantly (P>0.05).

Ghandehari Yazdi et al [6] investigated the effect of sucrose replacement with maltodextrin *and Sucralose mixture* on rheological properties and calories of traditional Qotab and reported that by increasing sugar replacement by maltodextrin *and Sucralose mixture* of component was reduced significantly (P<0.05) as consistent with the results of present study.

Lin and Lee [13] investigated the effect of Sucrose replacement with different percent of maltodextrin *and Sucralose mixture in* Chiffon Cake. The results showed that in all treatments, a value had no significant change in crust of cake (P<0.05) but in crumb, with the increase of replacement percent, component a) and redness are increased and they are inconsistent with the results of present study. The results showed that during storage, component a) was not changed and are consistent with the results of present study and the results showed that during storage, component a) was not changed and are consistent with the results of study and it is due to stability of maltodextrin *and Sucralose mixture during storage.*

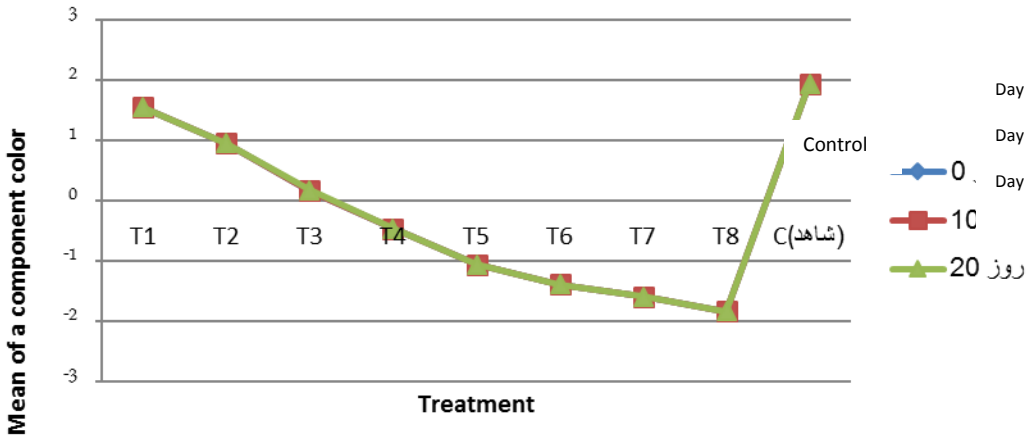

Figure 6- The changes of component a of different treatments of Kolompe cookies during different storage days at temperature 25°C

the analysis of results of component a) of Kolompe traditional cookies

Positive values of component b are yellow and its negative values blue [6]. The results showed that by increase of replacement percent of maltodextrin and Stevia, b value is reduced. Treatment C (control) had highest component b (high yellowness) and treatment T8 (50% maltodextrin and Stevia) had lowest component b (less yellowness). Also, the results showed that over time, component b and yellowness of samples were reduced.

In the studies by Vatankhah et al [8] by increase of Stevioside percent in formulation of biscuit component b, yellowness of samples is increased and it is inconsistent with the results of study.

Ghandehariyazdi et al [6] stated that by increase of replacement of sugar by maltodextrin *and* Sucralose mixture, component a of samples is reduced significantly ($P<0.05$) as consistent with the results of present study. The reason of reduction of yellowness is samples based on low Sucralose to maltodextrin. Maltodextrin is important in reduction of maillard reaction as by reduction of aquatic activity, dry matter percent is increased and maillard reaction is reduced.

Lin and Lee [13] stated that in all treatments, component b or yellowness in crust and crumb of cake increased and are inconsistent with the results of study. Also, the results showed that during storage, component b was not changed. It is due to stability of Sucralose-dextrin during storage.

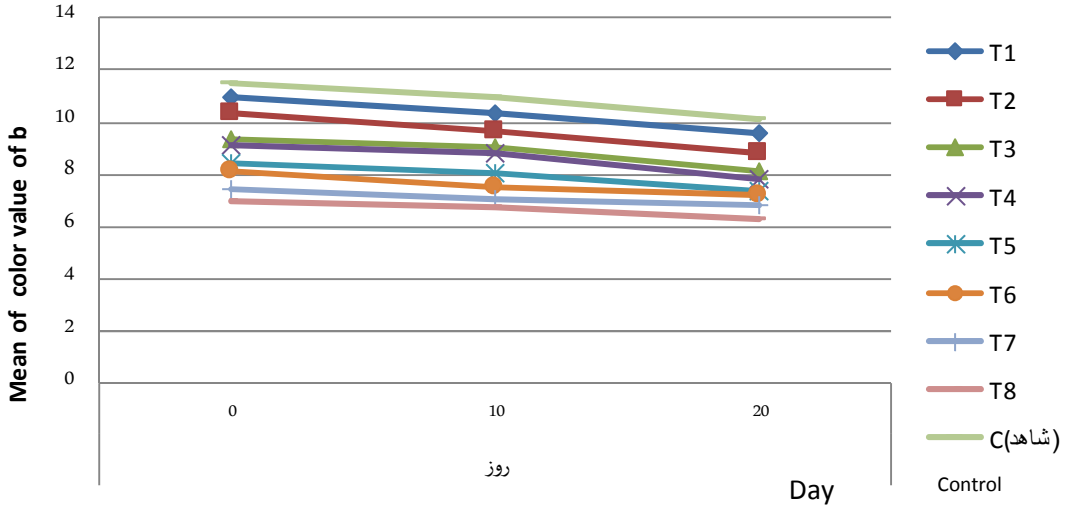

Figure 7- The change of component b of various treatments of Kolompe cookies during storage days at temperature 25°C

CONCLUSION

In this study, to reduce date in Kolompe cookies and improvement of texture and rheological properties, different percent of Maltodextrin and stevia were replaced with date. The results of tests showed that:

1-By increase of replacement of Maltodextrin and stevia, the texture was softer, high moisture and light color of product.
2-Based on the results of the replacement effect of Maltodextrin and stevia on texture, moisture, white index, a,b, L, pH values, ash of Kolompe cookies were significant ($P<0.01$).
3-The effect of storage on features of texture, moisture, white index, L,b components , PH are significant ($p<0.01$) and by increase of storage of texture, samples are hard, moisture, white index, b, L are less and PH are increased.
4-T8 treatment (50% Maltodextrin and stevia) after 20 days of storage at temperature 25°C in terms of total acceptance achieved high score. Thus, treatment T8 (50% Maltodextrin and stevia) were considered as best treatment.

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