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Production of propolis added egg powder and determination of some physicochemical properties

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Abstract

In this research, production of egg powder with some ingredients (Turkish cofee, cocoa and propolis) is investigated. Eggs were mixed with Turkish coffee (1%) and cocoa (1%), separetly. Then propolis was added to eggs at levels 0.5% and 1%, separetly. Samples were packaged in nylon bags after freeze drying, and then they were stored in room temperature for 14 days. Moisture (%), color, pH, mesophilic aerophilic bacteria (TMAB), water absorption and solubility index were performed for 0, 7 and 14 days of storage. The brightest sample (L*) was obtained from egg powder has 1% cocoa and 1% propolis (55.17±0.92). The highest pH value was determined in egg powder has 1% cocoa + 0.5% propolis (9.03±0.12). The addition of propolis resulted in a decrease of moisture and pH values in samples with Turkish coffee and cocoa. These results demonstrated that propolis improved some physicochemical properties of powders.

Keywords: cocoa, Turkish coffe, storage

1. Introduction

Eggs are food source that contains all the essential nutrients for humans. Although the energy value it provides to the human body is low, the fact that it contains most of the basic nutrients has made the egg known as a "nutritive value" food item. In addition to the nutritional properties of the egg; it also has technological features such as creating foam, providing gelling, gaining volume, providing color and flavor development, delaying crystallization, emulsifying, providing swelling [1].

Cocoa beans, which are the raw materials of cocoa products, are obtained from the fruits of the *Theobrama cacao* tree. While the place of consumption of cocoa and its products in human nutrition comes to the forefront thanks to the antioxidants it contains, cocoa nib, which is defined as the cocoa bean granule with its shell removed, is also rich in protein (11.5%), carbohydrates (7%), cellulose (9%) and fat (54%). its content draws attention [2, 3].

Turkish coffee is one of the indispensable elements of traditional Turkish cuisine. It is quite different and unique from other coffee varieties in the way it is obtained [4].

For Turkish coffee, the highest quality *Arabica* coffee beans are selected and used. It is obtained by forging in the thinnest possible form [5].

Propolis consists of a mixture of various oils, pollen, special resin and waxy substances collected from the cones and bark of trees, buds and shoots of plants by honey bees; It is a sticky substance with a very strong anti-viral, anti-bacterial, anti-fungal effect. Propolis has gained importance with its excellent natural medicine feature, discovered in the current century, in terms of carrying 22 nutrients that must be taken by the body for health [6].

In this research, we aimed to produce egg powder has Turkish coffee, cocoa and propolis. We tryed to produce a new kind of egg powder. This egg powder could be used for baking such as cakes. We thought to save time for expecially baking and get a new flavor. In addition, we aimed to benefit from shelf-life extending properties of propolis.

2.Materials and methods

2.1. Materials

Egg, cocoa, Turkish coffee were obtained from the local markets in Karaman, Turkey.

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Propolis was collected from Pertek district of Tunceli and all materials were brought to laboratory under aseptic conditions.

2.2. Methods

2.2.1. Preperation of egg powder

Eegs divided into 2 groups. Eggs were mixed with Turkish coffee (1%) and cocoa (1%), separetly. Propolis was melt at 160 ºC in drying oven (Nüve-FN 055, Ankara Turkey). Then propolis was added to eggs at levels 0,5% and 1%, separetly. So propolis got mixed with egg samples. The samples were frozen at (-18ºC) for 2 hours. Frozen samples were dried in freeze dryer (ScanvacCoolSafe 4-15 L Freeze Dreyer 95/55-80, Lynge, Denmark) at (-101˚C) for 4 days. Dried samples were packaged in nylon bags, and then they were stored in room temperature for 14 days. Moisture (%), color, pH, mesophilic aerophilic bacteria (TMAB), water absorption and solubility index were performed for 0, 7 and 14 days of storage.

2.2.3. Analysis of moisture (%)

Moisture (%) (hot air oven) determined the methods of the Association of Official Analytical Chemists [7]. Moisture (%) was determined by drying a 5 g sample at 105°C 18 hr to constant weight.

2.2.4. pH values

pH values were determined with a pH meter (pH 3110/SET WTW, Germany) after blending 10 g of samples with 100 ml of distilled water for 60 s in a homogenizer (Homogenizer HG-15D, Wisd, Germany) [8].

2.2.5. Color measurement

The exterior surface color of all extracts was measured using a chromameter (Hunterlab Colorimeter Colorflex) according to the CIELab system. Measurements were made by reading from three different points per sample on each measurement day. The average score of two experiments is recorded. CIE *L**, *a**, and *b**were determined by the method described by Hunt et al. [9].

2.2.6. Water absorption and solubility index

After 0,5 g of samples were placed in the centrifuge tube, 10 ml distilled water (25 °C) was added. The mixture was stirred every 5 minutes and kept at room temperature for 30 minutes.

After the samples were centrifuged at 7000xg for 15 minutes (5804R, Eppendorf centrifuge, Hamburg, Germany), the clear part, above the centrifuge tube, was poured into previously tared aluminum containers. It was dried in an oven at 105 °C until constant weight. The weight of the gel portion remaining in the centrifuge tube was measured on a precision balance [10]. The water absorption index and the water solubility index were calculated as follows.

$$water\ absorption\ index\ \left(\frac{g}{g}\right) = \frac{gel\ weight\ (g)}{Weight\ of\ sample\ (dry)(g)}$$

$$water\ solubility\ index\ (\%) = \frac{Weight\ of\ dissolved\ substance\ in\ the\ water\ (g)}{Weight\ of\ sample\ (dry)(g)}\ x\ 100$$

2.2.7 Total aerobic mesophilic bacteria

Plate Count Agar (PCA) (Merck, Germany) was used as the medium. From the prepared dilutions, 0,1 ml was transferred to the petri dishes and seeded by spreading plate method. The petri dishes were incubated at 30°C for 24-48 hours. Developed colonies were counted at the end of incubation and the results were given as cfu /g [7].

2.2.8 Statistical analysis

Each treatment was tested in duplicate samples with two replications. All the analyses were performed in two repetitions and two parallels, providing a total of four independent measurements. The results were expressed as means ± standard deviation. A two-way analysis of variance was used to test the effects of treatments at a 5% significance level by using SPSS 22 statistical package for Windows (IBM Corp., Armonk, New York, USA).

3.Results and Discussion

3.1. Hunter colour determination, pH and moisture

As can be seen in Table 1 and Table 2, the effects of egg powder types on L*, a*, b*, pH, moisture values and storage days on pH, moisture values were statistically significant ($p<0.05$). The brightest sample (L*) was obtained from egg powder has 1% cocoa and 1% propolis (C-1-P) (55.17±0.92) and lowest bright sample was egg powder has 1% Turkish coffee and 1% propolis (Tc-1-P) (44.64±0.96). It is determined that C-1-P has the highest a* and b* value (6.31±0.12 and 18.49±0.37, respectively). The lowest a* and b* value was obtained from Tc-

(5.64±0.07 and 11.79±0.02 respectively).The addition of propolis resulted in an increase of L *, a *, b* values in samples with Turkish coffee, but it resulted in a decrease in samples with cacao.

The highest pH value was determined in egg powder has 1% cocoa + 0.5% propolis (C-0.5-P) (9.03±0.12). The highest moisture was determined egg powder has 1% Turkish coffee + 0.5% propolis (Tc-0.5-P) (4.63±0.02). The addition of propolis resulted in a decrease of moisture and pH values in samples with Turkish coffee and cocoa.

It has been seen in Table 2, there is a decrease in pH values and an increase in moisture in all storage days. It was observed the highest pH value (9.02±0.08) was reached on 0th day; the highest moisture (7.94±0.07) was reached on the 14th day during the storage (Table 2).

Koç et al. [11] found moisture content of egg powders varied in the range of 1.83–3.35%. It is generally accepted that moisture content should be below 5% for safe storage [12]. It is determined that our results is higher than %5 only in 14th day (7.94±0.07).

Li et al. [13] stated egg powder had more higher solubility under higher pH condition. In our study, the solubility index was found to be high on the day when the pH value was high. *Du* and *Ahn* [14] reported that egg yolk powder has L* value as 91.12; a* value as 3.69 and b* value as 26.3.

Table 1. Anova comparison test results of the effect on L *, a *, b*, pH, moisture (%), water absorption and solubility index

Factor	L^*	a^*	b^*	*pH*	*moisture*	*water absorption index*	*water solubility index*
Tc-0,5-P	45.78±0.83^{b}	6.08±0.09^{a}	12.96±0.03^{c}	9.02±0.13^{a}	4.63±0.02^{a}	1.15±0.19^{b}	79.41±0.88^{a}
Tc-1-P	44.64±0.96^{b}	5.64±0.07^{b}	11.79±0.02^{d}	8.92±0.13^{b}	4.47±0.02^{b}	1.18±0.12^{b}	80.02±0.68^{a}
C-0,5-P	46.88±0.87^{b}	6.07±0.03^{a}	16.73±0.09^{b}	9.03±0.12^{a}	4.54±0.07^{ab}	1.26±0.07^{a}	74.13±0.99^{b}
C-1-P	55.17±0.92^{a}	6.31±0.12^{a}	18.49±0.37^{a}	8.85±0.17^{c}	3.91±0.12^{c}	1.29±0.19^{a}	71.63±0.92^{b}

Table 2. Anova comparison test results of the effect of storage days

Factor	*pH*	*moisture (%)*	*water absorption index*	*water solubility index*
0.day	9.02±0.08^{a}	0.98±0.03^{c}	0.98±0.17^{c}	81.47±0.77^{a}
7. day	8.94±0.12^{b}	4.23±0.02^{b}	1.04±0.27^{b}	78.55±0.82^{b}
14. day	8.91±0.07^{b}	7.94±0.07^{a}	1.64±0.15^{a}	68.86±0.71^{c}

(Comparison of the means of 4 replicates with the Tukey's test shows that there is a significant difference between the a-c means on the averages ($p<0.05$).

3.2. Total aerobic mesophilic bacteria, water absorption and solubility index

Total aerobic mesophilic bacteria was not determined during all storage days (0 log cfu/g). As can be seen in Table 1 and Table 2, the effects of egg powder types and storage days on water absorption and solubility index were statistically significant ($p<0.05$). C-1-P sample has the highest water absorption index as 1.29±0.19; Tc-1-P sample has the highest water solubility index as 80.02±0.68 (Table 1). These results were consistent with the previous finding of *Li et al.* [13].

The addition of propolis resulted in an increase of water absorption index in samples with Turkish coffee and cocoa. It resulted in an increase of water solubility index in samples with Turkish coffee, but a decrease was detected in water solubility index samples with cacao. Highest water absorption index as 1.64±0.15 was detected on 14th day; highest water solubility index as 81.47±0.77 was detected on 0th day of storage (Table 2). Storage time causes an increase in water absorption index and a decrease in water solubility index.

Li et al., [13] found solubility of egg powders varied in the range of 80-93.16. These results were consistent with our study.

4.Conclusion

Total aerobic mesophilic bacteria was not determined, since the product was in powder form and moisture did not increase too much during the storage period. But storage safety decreased since the moisture value of the powders increased above 5% on the 14th day. This shows that more secure packaging is needed. A new product with propolis, Turkish coffee and cocoa flavor was produced at the end of the study. These results demonstrated that propolis improved some physicochemical properties of powders.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human or animal subjects (if exist) respect the specific regulation and standards.

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