

QUALITY AND SHELF LIFE OF A DRAGEE PRODUCT BASED ON SUNFLOWER KERNELS

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Abstract

Dragee products are confections made by coating confectionery centers with sugar or chocolate in a rotating drum. The objective of this study has been to check the applicability of confectionery sunflower as confectionery centers in dragees. Sunflower kernels were coated in sugar syrup, packaged in two kinds of packaging material (transparent and nontransparent PVC bags) and kept at room temperature and in light. Quality of this type of product depends on technological characteristics of sunflower kernels (granulometric composition of seed, hulling efficiency) and the technology of dragee making. The obtained results showed that the dragees had an excellent sensory quality. After three months of keeping the dragees in nontransparent PVC bags exhibited the required color stability, maintained an excellent sensory quality and showed slight changes in peroxide number and the content of free fatty acids.

Introduction

Sunflower (*Helianthus annuus* L.), a rich source of valuable nutritive compounds, proteins, essential fatty acids, vitamin E, iron and cellulose is used more and more as a substitute for some kinds of nuts which are extensively used in the confectionery industry (Buendia and D'Appolonia, (1986); Dettmer, 1998). Confectionery sunflower applicable in confectionery production has a hull content of 40-45% and 30% of oil (Dreher et al., 1983). Kernels may be consumed fresh or roasted, salted or sweetened. They are added to a variety of bakery or confectionery products, and they are even used in the production of refreshing drinks (Jackson, 1995; Karlović et al., 1992). Good functional characteristics make them applicable in the production of cookies, where sunflower kernels are ground into flour or they are added in fatty fillings (Karlović et al., 1992; Karlović et al., 1997). Another way to use sunflower kernels is in the production of cereal bars or granolas and mueslis. Whole sunflower kernels may be used as dragee centers or they may be added to chocolate and similar products. Dragee products are confections made by coating confectionery centers, which may be soft or hard (wheat kernels, nuts, sunflower kernels) and are coated with sugar or chocolate (Komen, 1986; Loftgren, 1976). Quality of dragees depends on the uniformity of kernel size, i.e., it is necessary to select kernels with specified technological characteristics

(Lusas, 1982). Important quality characteristics of dragees are the adherence of the coating to kernels and the adherence of the inner and outer sides of the coating. Problems that may occur in the production of dragees are hulls left on kernels. Because of that, hulling efficiency has to be examined in addition to the technological characteristics of the kernel (Riedel, 1997). In the framework of this study we organized a pilot production of dragees with sunflower kernels as dragee centers. Sunflower kernels of uniform size were coated with sugar syrup. As the finished dragees were white in color, a problem was foreseen in color change because of kernel tanning due to the presence of phenolic compounds (Sleeter and Cambell, 1982). Stability of dragees was determined on the basis of instrumental measurements of color change, sensory characteristics and the fatty acid content and peroxide number readings performed at regular time intervals (Sosulski, 1979).

Materials and Methods

Confectionery Sunflower. Hybrid Delija from the Institute of Field and Vegetable Crops, Novi Sad, Serbia and Montenegro was used. Sugar syrup (d.m. 60%) was used and packaging materials: multilayered nontransparent bags, BOPET and polyethylene PVC bags.

Chemical Composition. Main physical and chemical properties of sunflower kernels were determined by standard AOAC methods.

Production of Dragees. Dragees with sunflower kernel centers were produced under industrial conditions. Before coating, kernels were roasted for a short period in an open roaster. Kernels were dropped into the drum together with a solution of gum arabic which made a protective coat on the kernel surface and binding material between the kernel and the coating. The coating was made of finely crystallized sucrose which was formed by alternately applying and drying 60% sugar syrup. The dragees were packaged in two kinds of bags - those made of multilayered nontransparent foil (BOPET) and those made of polyethylene PVC foil, and kept at room temperature and in light for five months to assess the storage quality of the product.

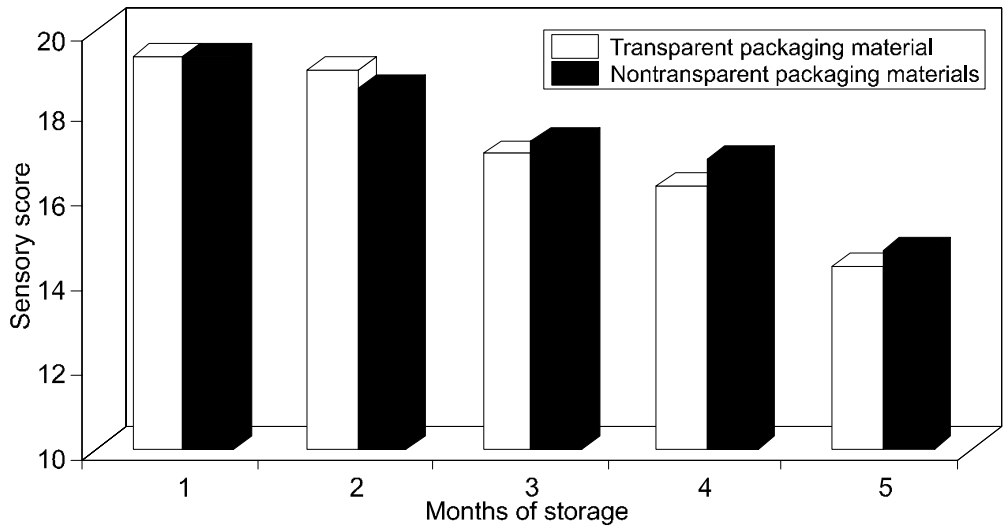
Product Quality. Sensory evaluation of dragees included the following parameters: external appearance, color, aroma, structure, chewing quality and taste. Color was determined with a photoelectric colorimeter MOM Color 100. Peroxide number and free fatty acid content were determined in oil extract of the product. Analyses were made seven days after dragee making and after that at one-month intervals.

Results and Discussion

Main characteristics of sunflower kernels are given in Table 1. Kernels of the variety Delija were found to have satisfactory content of protein and oil, which is characteristic for the confectionery sunflower. The low values of peroxide number and free fatty acid content are indications of high stability of this kind of raw material. Figure 1 shows the changes in sensory characteristics of the dragees depending on storage period and type of packaging material.

Table 1. Main characteristics of the Delija sunflower kernel.

Quality factor	Value
Moisture (%)	6.34
Oil (% d.m.)	40.05
Protein (% d.m.)	32.43
Cellulose (% d.m.)	5.8
Peroxide value (mmol/kg)	3.61
Free fatty acid content (%)	0.49



Quality categories:

Excellent	17.6-20.0 points
Very good	15.2-17.5 points
Good	13.2-15.1 points
Satisfactory	11.2-13.1 points
Unsatisfactory	<11.2 points

Figure 1. Effect of storage period and packaging on the sensory quality of dragees.

The sensory quality of dragees went down with the duration of storage regardless of packaging. Fresh and one-month-old dragees had an excellent sensory quality. The quality dropped suddenly after two months. After four months of storage dragees had good quality on the basis of total score for sensory quality. Changes were largest in aroma and taste. Dragees acquired an atypical odor and a rancid taste. Dragees kept in nontransparent bags had higher

sensory quality than those kept in transparent bags. Changes in dragee color during the storage period are shown in Table 2.

Table 2. Change in dragee color depending on packaging material and keeping period.

Merilo boje		Transparent bags				Nontransparent bags			
		Months of storage							
		1	2	3	4	1	2	3	4
Trihrom. vred.	X ₁	28.74	30.93	28.43	34.62	29.48	30.17	30.64	26.51
	X ₂	7.12	7.3	7.1	8.53	7.03	7.07	7.71	6.5
	Y	36.84	39.06	35.61	43.48	37.67	38.26	37.75	33.25
	Z	40.97	43.81	36.91	43.65	42.57	39.42	34.98	34.58
CIELAB sistem	a _{hu}	-0.75	-0.18	1.84	1.41	-1.22	-0.77	3.89	1.27
	b _{hu}	2.64	2.18	5.09	6.9	1.83	5.51	9.25	4.8
	L _{hu}	60.69	62.49	59.67	65.93	61.37	61.85	61.44	57.66
	ΔE _{hu}	26.52	27.72	28.97	29.4	28.8	32.72	34.43	40.86
	W _{TA}	28.29	21.25	18.22	17.44	31.22	18.77	18.26	17.4

Figure 2 shows the changes in free fatty acid content occurring in oil extracted from dragees during the period of storage.

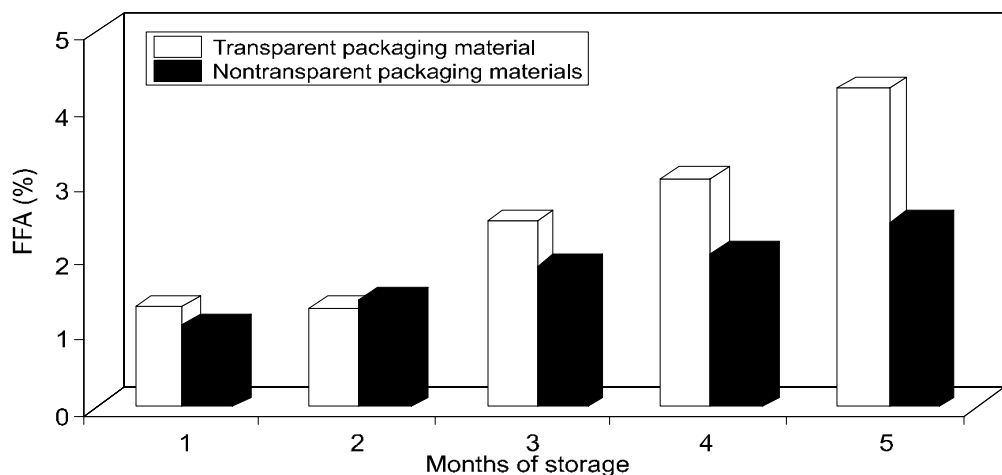


Figure 2. Change in the free fatty acid content (FFA) in dragees depending on storage period and packaging material.

The measurements of color change showed that changes (ΔE) were smaller with dragees in nontransparent bags. This was an indication that light affected the shelf life of dragees. The light score after Hunter (L_{hu}) showed that the dragees in transparent bags were lighter than those in nontransparent bags. The whiteness index after Taube (W_{TA}) was reduced with duration of keeping regardless of packaging. A sudden color change that occurred after two months of storage indicated that dragees underwent the largest changes during that period, as corroborated by the results of sensory evaluation.

The free fatty acid content (FFA) increased with the duration of storage regardless of packaging, as indicated by the reduction in sensory quality. Regarding this parameter, nontransparent bags turned out to be more suitable than transparent ones since the FFA values in the course of the storage period were lower in the case of the former bags.

Because the peroxide number may change over a short period of time, this parameter did not provide a clear picture of the changes taking place in dragees during the period of keeping. Still, Figure 3 shows that the peroxide number increased in the analyzed samples regardless of the kind of packaging, although the rate of increase was higher in transparent bags. The sudden increase in peroxide number after four months of storage indicated that the sunflower kernels suffered significant oxidative changes in spite of the sugar coating.

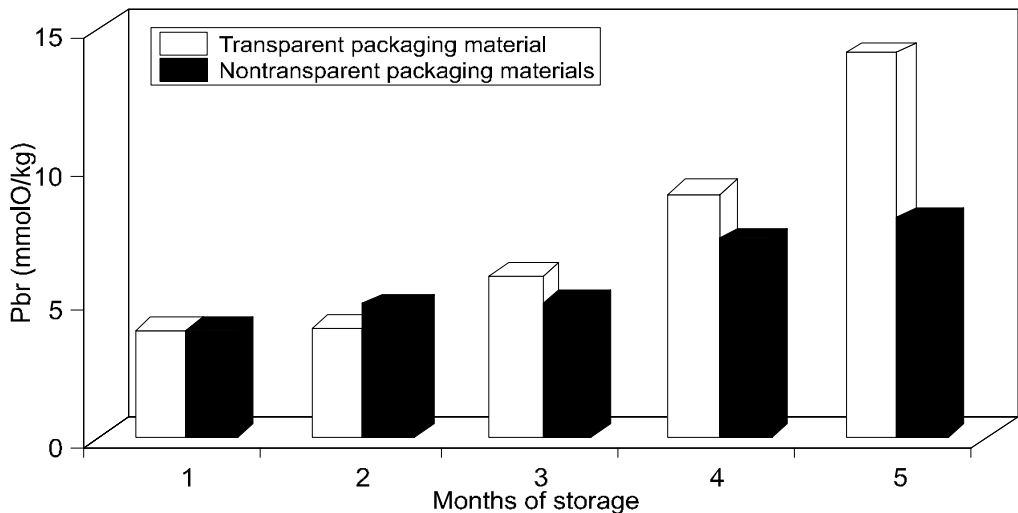


Figure 3. Effect of kind of packaging and duration of storage on changes in peroxide number in dragees.

The dragee product made by coating sunflower kernels in sugar syrup had a uniform color characteristic for this type of coating, a slightly textured surface, and no crumbling of the coating or cracking of the kernels. These characteristics, according to the total sensory score, placed the product into the category of excellent sensory quality. The first changes in color, free fatty acid content and peroxide number occurred after two months of storage. The analyzed parameters showed that the optimum duration of storage is four months. The quality of dragees packaged in BOPET nontransparent bags was more stable than that of dragees packaged in transparent PVC bags.

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