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# Investigation of colour agent content of paprika powders with added oleoresin

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**Abstract.** The paprika oleoresin, that is an oil soluble extract from the fruits of Capsicum Annum Linn or Capsicum Frutescens, is used often to raise the colour agent content of paprika powders. We investigated how the colour agent content of paprika powder samples with added oleoresin change in the course of storage. The colour agent content of 7 different quality powders was increased with 7-75% using two types of oleoresin. The initial colour agent content of the samples changed between 41 and 169 ASTA units. The powders were made from Chinese, Peruvian and Hungarian paprika. The colour agent content of the samples was measured throughout 10 months. The measured values were analysed using ANOVA. The decrease of colour agent content varied between 22 and 51 percent, while the average reduction was 33 percent. The initial colour agent content of the paprika powder samples did not influence the colour agent content decrease significantly. The effect of the quantity of added oleoresin did not influence either the colour agent content decrease significantly. The decrease of the colour agent content of the Hungarian paprika samples significantly differs from the Chinese and Peruvian paprika samples colour agent content decrease.

**Keywords and phrases:** paprika powder, colour agent content, storage.

# 1 Introduction

The use of natural food colours is preferred to that of artificial dyestuffs for modern alimentary purposes. Paprika is a spice plant grown and consumed in considerable quantities world-wide, and also used as a natural food colour. The colouring power of paprika powders is directly determined by the quality and quantity of the colouring agent of paprika. The colour agent content of powders decreases during storage time and is influenced by the steps of the processing. Dehydration is the most critical step of the processing. The effect of the heat impairs the colour agent, aroma and flavour substratum of paprika. Several researchers investigated the optimal parameters of dehydration (*Minguez-Mosquera et al.*, 2000; *Ramesh et al.*, 2001; *Shin et al.*, 2001; *Doymaz* and *Pala*, 2002; *Kim et al.*, 2004; *Perez-Gamez et al.*, 2005; *Simal et al.*, 2005). *Topuz et al.* (2011) compared the Refractance Window (RWD) method to dry paprika with freeze-drying, hot-air oven drying and natural convective drying methods. It was depicted that the least colour agent content decrease was in the case of natural convective drying method. The colour agent content reduction is affected by the condition of storage. There are many papers on the changes in the colour agent content of the paprika storage processes (*Park et al.*, 2007, *Banout et al.*, 2011, *Topuz et al.*, 2011, *Chetti et al.*, 2012).

The paprika oleoresin, which is an oil soluble extract from the fruits of Capsicum Annum Linn or Capsicum Frutescens, is used often to raise the colour agent content of paprika powders. We investigated how the colour agent content of paprika powder samples with added oleoresin changes in the course of storage.

# 2 Materials and methods

### Materials

The colour agent content of 7 different quality powders was increased. The initial colour agent content of samples changed between 41 and 169 ASTA units.

The powders were made from Chinese, Peruvian and Hungarian paprika. The colour agent content was increased using 0.5-3.0 g oleoresin added to 100 g paprika powder. *Table 1* shows the investigated powder samples, their initial colour agent content and the quantity of added oleoresin.

Table 1: The parameters of stored paprika samples

| Samples | Initial colour agent content (ASTA unit) | Added oleoresin (g) | | | | |
|---|---|---|---|---|---|---|
| Hungarian paprika | 169 | 0.5 | 1.0 | 1.5 | 2.0 | |
| Hungarian paprika | 65 | 0.5 | 1.0 | 1.5 | 2.0 | |
| Hungarian paprika | 129 | 0.5 | 1.0 | 1.5 | 2.0 | |
| Peruvian paprika | 61 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
| Peruvian paprika | 41 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
| Chinese paprika | 106 | 1.0 | 1.5 | 2.0 | 2.5 | |
| Chinese paprika | 109 | 1.0 | 1.5 | 2.0 | 2.5 | |

**Methods**

After the homogenization of powders, the colour agent content of samples was measured. The ASTA unit was used to mark the colour agent content of the paprika powders according to MSZ EN ISO 7541. The samples were stored at room-temperature, protected from light. The colour agent content was measured monthly for 5 months, and after 8 months and then 10 months. The measured values were analysed using analysis of variance (ANOVA). To control for the homogeneity of variances, the Hartley, Cochran and Bartlett tests were applied.

## 3 Results and discussion

To evaluate the change of the colour agent content, we calculated the value of the decrease of the colour agent content, measured different times, correlate to the initial value. The values were given in percentage. First, we analysed how the colour agent content decrease during 10 months was influenced by the initial paprika samples and the quantity of added oleoresin. The ANOVA was applied. In *Table 2*, we can see the results of the tests for homogeneity of variances. The values show that the homogeneity was realized; so, the ANOVA was applicable.

Table 2: Results of tests for homogeneity of variances in case of colour agent content decrease during 10 months

| Factor | Hartley F-max | Cochran test | Bartlett $\xi^2$ | Significance level |
|---|---|---|---|---|
| Quantity of added oleoresin | 8.31 | 0.28 | 6.76 | 0.34 |
| Initial paprika powder | 2.61 | 0.36 | 2.65 | 0.44 |

The result of ANOVA is shown in *Table 3.* It can be established that the quantity of added oleoresin did not influence the colour agent content decrease significantly, but the initial paprika powder affected it significantly.

Table 3: Variance table in case of colour agent content decrease during 10 months

| Factor | F value | Significance level |
|---|---|---|
| Quantity of added oleoresin | 0.72 | 0.54 |
| Initial paprika powder | 31.99 | 0.00 |

In *Figure 1*, we can see the averages decrease with confidence interval at a level of 95%.

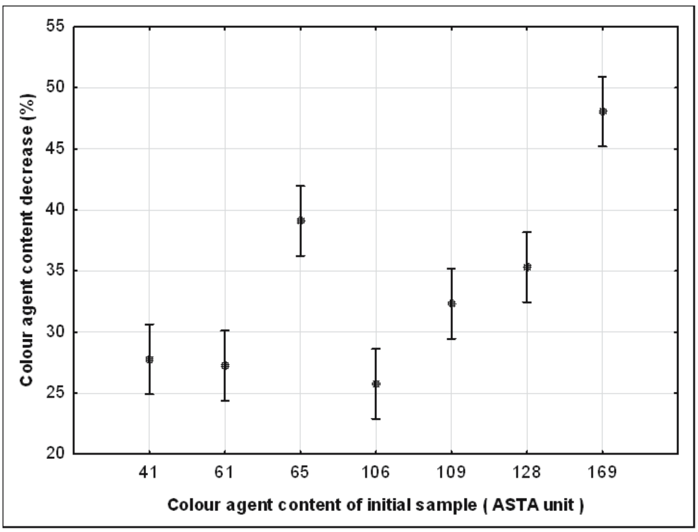


Figure 1: Results of ANOVA for colour agent content decrease during 10 months (average with confidence interval at a level of 95%)

The decrease of colour agent content varied between 22 and 51 percent. It seems good that the reduction was most significant in the case of Hungarian paprika powders (65 ASTA, 128 ASTA and 169 ASTA) and the loss was small for Peruvian powders. So, the change of colour agent during storage was investigated separately for Hungarian, Peruvian and Chinese paprika powders. In Table 4, we can see the results of the tests for homogeneity of variances.

Table 4: Results of tests for homogeneity of variances in case of different paprika powder samples

| Samples | Factor | Hartley F-max | Cochran test | Bartlett $\xi^2$ | Significance level |
|---|---|---|---|---|---|
| Hungarian paprika | Quantity of added oleoresin | 2.21 | 0.73 | 1.84 | 0.76 |
| | Storage time | 5.32 | 0.28 | 10.96 | 0.09 |
| Peruvian paprika | Quantity of added oleoresin | 1.74 | 0.21 | 2.53 | 0.77 |
| | Storage time | 2.27 | 0.24 | 5.82 | 0.44 |
| Chinese paprika | Quantity of added oleoresin | 2.87 | 0.31 | 5.57 | 0.23 |
| | Storage time | 6.84 | 0.39 | 10.44 | 0.10 |

The values show that the homogeneity was realized; so, the ANOVA was applicable. The results of ANOVA are shown in *Table 5.* It can be established that the quantity of added oleoresin did not influence the colour agent content decrease significantly during storage.

Table 5: Results of analysis of variances in case of different paprika powder samples

| Samples | Factor | F value | Significance level |
|---|---|---|---|
| Hungarian paprika | Quantity of added oleoresin | 2.30 | 0.071 |
| | Storage time | 54.1 | 0.001 |
| Peruvian paprika | Quantity of added oleoresin | 2.13 | 0.061 |
| | Storage time | 75.73 | 0.000 |
| Chinese paprika | Quantity of added oleoresin | 2.21 | 0.055 |
| | Storage time | 13.79 | 0.010 |

Storage time affected colour agent reduction significantly. In Figure 2 and Figure 4, we can see the averages decrease with confidence interval at a level of 95% in the case of Hungarian, Peruvian and Chinese paprika powders.

The colour agent content of Hungarian paprika powders decreased with 40% on average after a period of 10 months. The rate of decrease was 20% during the first month, while, after the reduction, it was slower. In the case of Peruvian paprika powders, the loss of colour agent was smaller during the storage: it was only 27% on average. It was 20% after 4 months.

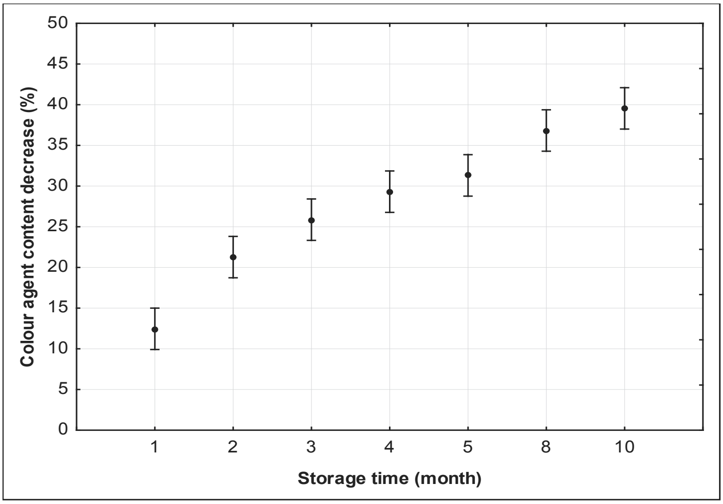


Figure 2: Results of ANOVA for colour agent content decrease in case of Hungarian paprika (averages with confidence interval at a level of 95%)

The colour agent of Chinese paprika powders dropped 30% on average after 10 months. The rate of the loss was the most in the first month.

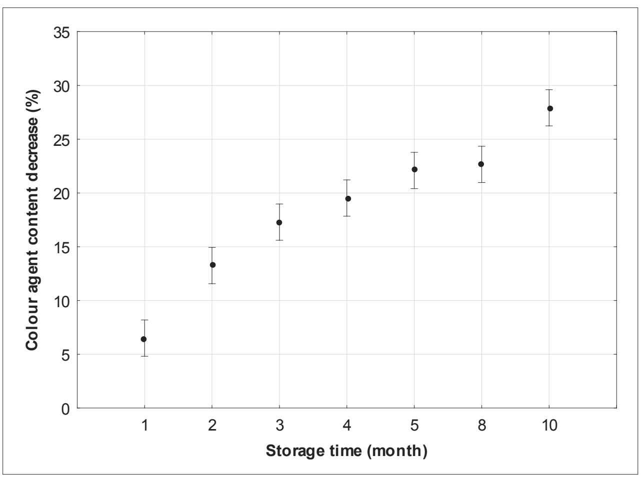


Figure 3: Results of ANOVA for colour agent content decrease in the case of Peruvian paprika (average with confidence interval at a level of 95%)

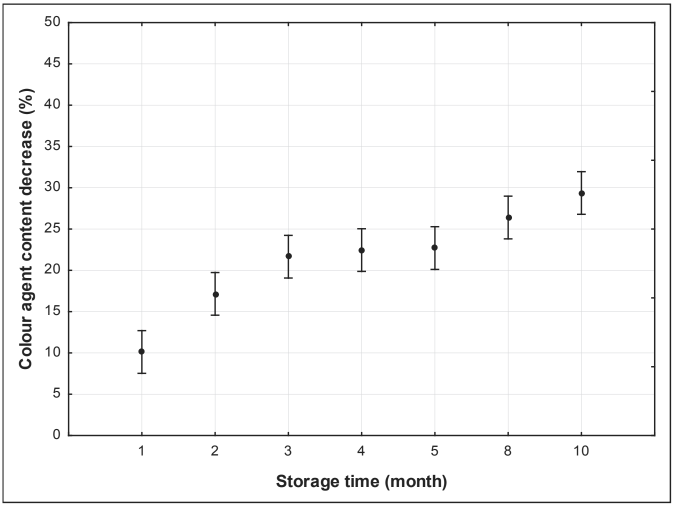


Figure 4: Results of ANOVA for colour agent content decrease in the case of Chinese paprika (average with confidence interval at a level of 95%)

In summary, we can state that the colour agent content decrease was the same in the case of samples with and without added oleoresin. The decrease of the colour agent content varied between 22 and 51 percent, while the average reduction was 33 percent. The colour agent content loss was most in the case of Hungarian paprika powders.

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