INVESTIGATION OF THE RELATION BETWEEN THE COLORANT CONTENT AND THE COLOUR CHARACTERISTICS OF THE EDIBLE OIL BASED EXTRACTS OF THE PAPRIKA GRIST

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ABSTRACT

During our work we performed the color measurements of the oily extracts from the Hungarian paprika grist. We defined a color index from the CIELab color coordinates, by means of which the rank in the redness sequence of the oily colorant extract can be evaluated. We established that there was a tight linear relation between the colorant content of the grist expressed in ASTA value and the color index of the oily extract. In case of the oily extracts the color index calculated from the data of the color measurement is adaptable to evaluate the coloring capability and via this it is appropriate for the color classification of the paprika grist.

1. INTRODUCTION

The color belongs to the basic physical properties of the paprika grist, which is one of the essential quality criterions and can be defined by the sense perception of the consumers.
Before the appearance and spreading of the photometry the color of the paprika was judged visually only comparing with the fixed specimens. Later and for the time being in the qualification besides the visual judgment the colorant content is measured too. This value is a number, which is proportional to the absorbance rate measured on a given wavelength (460 nm) of the solution derived from the total colorant content of grist by means of extraction with an organic solvent (acetone). This number is expressed in units of "g colorant / kg dry material" or in ASTA value [1]
Since the wide-spreading of the colorimeters the measurement of the grist's color and its expression in exact CIELab color coordinates are solved. However despite of this it was failed to find a classification method based on the color coordinates which would be in accordance with the ASTA value measured by photometry. [2], [3], [4].
The colorants of the paprika are soluble in fat and in the households the grist of paprika is used for coloring the meals containing edible fats. From this point of view the real value of the paprika grist is the coloring capability defined by the color of pigments solved in fats.
The aims of our study were the followings:

- To investigate the relation between the CIELab color coordinates of the edible oil based extracts and the colorants' content of the grist from different sorts of the Hungarian paprika;
- To search color classification possibilities for the edible oil based pigment extracts of paprika on the base of color coordinates;
- To establish the mathematical relation between the color index of the oil based pigment extracts and the colorant content of the grist.

2. MATERIALS AND METHODS

2.1. Materials

We used for our investigations 47 different paprika grist having colorant contents between the 48 – 225 ASTA values. The paprika were originated from the crop 2006 and harvested partially in the Szeged district and furthermore in Kalocsa district, Békés county and Zala county. The production of the grist was made in the Szeged Paprika Co and in three smaller mills while in case of 8 samples the domestic method was applied. To produce the oily extracts of the grist the refined sun seed edible oil of Floriol brand (Bunge Zrt, Martfű) was used.

2.2. Methods

2.2.1. Color measurement

For the preparation of the oily extracts 2 grams of grist was weighed with accuracy of 0.001 g and afterwards 50 g of Floriol sun seed oil was added. The mixture was heated up to the temperature of 70°C and with constant propagation kept on this temperature for 10 minutes. After this the mixture was cooled down to the room temperature and was stored in dark place for 24 hours in order to sedimentate. For the measurement of the color the HunterLab MiniScan XE Plus type colorimeter working on the spectrophotometry principle, an additional attachment capable for the color measurements of liquids and a glass graduated jar were used. To ensure the constant level of the liquid a black ring being deposited in the jar and having 1 cm height was applied. After the sedimentation the oily paprika colorant extract was filled into the jar up to the height of the ring and a white ceramic coated disc was put on the top of the ring as the background. By this way the measurement of the CIEL*a*b* color coordinates in trans-reflex mode was performed applying this white background.

2.2.2. Determination of the colouring matter content

The colouring matter content of paprika grist was determined in acetone extracts by photometry at he wavelength of 460 nm according to the ASTA international standard method. Values were expressed in ASTA unit. [5]

3. RESULTS AND DISCUSSION

3.1. Color examination of the oily extracts of the grist having different colorant contents

In this part we investigated if there was any functional dependence between the colorant content of the paprika grist expressed in ASTA units and the color coordinates of the oily extracts. We prepared the extracts from the every grist, having the same paprika/oil ratio; namely in concentration of 2 grams paprika/50 grams oil to compare the colors of the different paprika grist solved in oil. We used for our investigations the L*a*b* color coordinates of the 47 paprika grist having known colorant contents. The color coordinates are illustrated in dependence on the ASTA values of the grist on the Fig. 1.a-c.

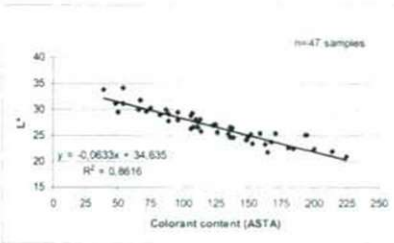

Fig. 1a

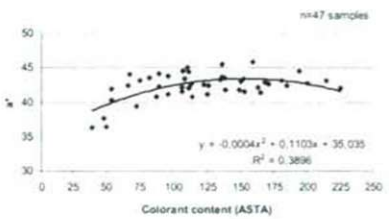

Fig. 1b

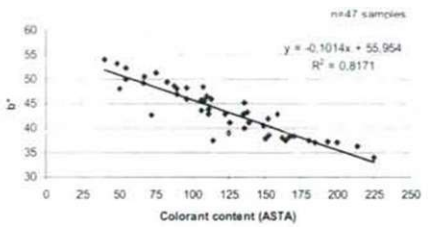

Fig.1c

Fig.1a-c: The variation of the color coordinates of the oily paprika extracts in case of the paprika having different ASTA values

The figures 1.a-c and the correlation coefficients of the adapted functions prove, that the color coordinates of the extracts have medium (L*,b*) or weak (a*) relation to the ASTA values of the grist.

3.2. The color index of the oily extracts of the paprika grist

In the food industry it is the experimental fact in the visual judgment practice, that the same quantities of grist in the same quantity of fats show wide variety of colors beginning from the orange through the brownish-red tone up to the bright red or dark ones. In order to realize the classification by color it would be reasonable to form the color index from the measured CIELab coordinates.

From the measured CIELab coordinates we created a number to establish a sequence of the redness of the oily colorant extracts and we named it as "the color index" and labeled as "CI". Creating the color index we took into consideration the meaning of the "L*a*b*" color coordinates. The increasing of the color index should reflect the higher ranks in the redness sequence of the samples. According to this the color index is directly proportional to the red-yellow coordinate ratio (a*/b*), directly proportional to the coordinate (a*), expressing the rate of redness and inversely proportional to the brightness coefficient (L*). Mathematically the color index can be calculated on the basis of the following formula:

$$\mathbf{CI} = \mathbf{100}\frac{\mathbf{a}^*}{\mathbf{b}^*}\cdot\frac{\mathbf{a}^*}{\mathbf{L}^*}$$

where:

CI: the color index;

a*, b*, L*: the measured color coordinates of the oily extracts

100: multiplying coefficient, serving to elongate the band of the color index.

The redness sequence created on the basis of the increasing of color index values and the color ranking formed by the visual judgment of the oily paprika extracts are in good coincidence in case of the grist examined by us.

3.3. The examination of the relation between the color index of the oily colorant extracts and the colorant content of the grist

To display the relation we illustrate the color indexes of the oily extracts in dependence on the colorant content of the grist expressed in ASTA units (Fig.2).

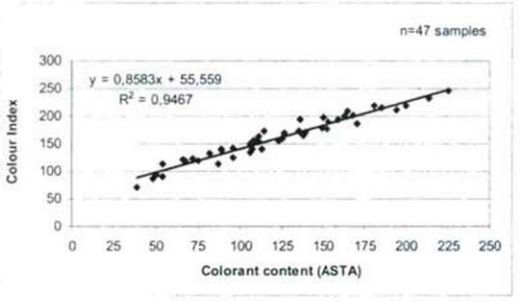

Fig. 2 – The color index variations of the oily paprika extracts in dependence on the ASTA values of the grist

The color index of the oily extract and the colorant content of the grist expressed in ASTA values are in tight linear proportion (R2= 0,95), i.e. by the increasing of the ASTA values the coloring capability of the grist will be increased proportionally; with other words the color index of the oily extract. Though the mathematical relation is rather tight between the ASAT value of the grist and the color index of the oily extract, but from the practical point of view to make conclusions from the ASTA values concerning the color of the oily extracts needs some kind of carefulness.

We can establish by the results of our investigation that for the classification of the paprika grist on the base of the coloring capability it is not enough to give the ASTA values of the grist but it is worthy to give the coloring capability using the color index of the oily extract, which can be measured and by means of the color coordinates „L*a*b*" and can be easily and unambiguously calculated.

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