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SIMULTANEOUS DETERMINATION OF TARTRAZINE AND CARMOISINE IN FOODSTUFFS BY SPECTROPHOTOMETRIC METHOD

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***ABSTRACT*:**
Spectrophotometric method was developed and applied for simultaneous determination of two colorants: Tartrazine (T) and Carmoisine (C), in Syrian foodstuffs. This study was applied on several Syrian foodstuffs as: (Custard Powder Strawberry, Crème Caramel Strawberry, Cream Chantilly Strawberry, Cotton Candy, Yellow Chewing-gums, Strawberry Chewing-gums, Silca Strawberry, Windmill powder Jelly, Lemon and Strawberry Diva, Samiry Candies, Lemon and Strawberry Ice Cream). Derivative spectrophotometric (DS) method was applied for the determination of (T) and (C), respectively. Tartrazine was determined by first derivative spectrophotometry at 370 nm ($^1D_{370}$); and Carmoisine was determined by first derivative spectrophotometry at 570 nm ($^1D_{570}$). Linearity ranges were 4-40 μg/mL for (T) and 2-40 μg/mL for (C), regression analysis showed a good correlation coefficients R^2 = 0.9999 and R^2 = 0.9998 for (T) and (C), respectively. The limit of detection (LOD) and limit of quantification (LOQ) were to be 0.73 and 2.23 μg/mL for (T), 0.30 and 0.91 μg/mL for (C), respectively. The proposed derivative method was successfully applied to analysis individual or mixture of Tartrazine and Carmoisine in foodstuffs. All studied samples showed dye levels conformity with Syrian legislation.

Keywords: *Tartrazine, Carmoisine, Derivative Spectrophotometry.*

1. INTRODUCTION

Colorants are the first sensory parameter by which food quality, making food more attractive. Synthetic colorants are usually added to food to replace the natural colorants that can be lost during processing or to avoid variations in the color of the final product. The trouble is that some synthetic Azo dyes such Tartrazine can be toxic to the human health when contact with some drugs which can cause allergic to some people[1]. Also researches have shown that it can be linked to asthma, hyperactivity particularly among children[2].

Thus, various methods have been proposed to control the amount of colorants in food such as capillary zone electrophoresis (CZE)[3], differential pulse polarography[4-5] and voltammetric methods as adsorptive voltammetry[6]. Chromatographic methods have been used for colorants analysis in foods, high performance liquid chromatography (HPLC)[7], high-performance ion chromatography[8], reversed-phase thin-layer plates[9], reverse phase high performance liquid chromatographic (RP-HPLC) method[10-11] and micellar electrokinetic capillary chromatography (MEKC)[12]. Spectrophotometric[13-14] and derivative Spectrophotometric methods[15-16] are successfully applied to determine other synthetic dyes.

The aim of this work is to develop a simple and accurate spectrophotometric method for simultaneous determination of C (E122) Fig.1, T (E102) Fig. 2 and their mixtures in different foodstuffs without prior treatment by UV/Vis spectrophotometry and derivative spectrophotometry (DS), where their mixtures give strawberry shades to products.

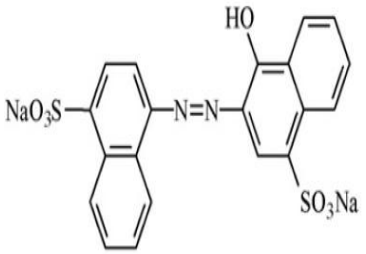

Fig. 1. Structural formula of Carmoisine.

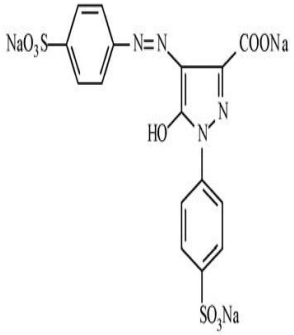

Fig. 2. Structural formula of Tartrazine.

2. MATERIALS AND METHODS

2.1 Apparatus

All spectral measurements were carried out using a T80+ UV/V spectrophotometer PG instrument Ltd (UK) connected to computer, quartz cells 1 cm. Ultrasonic bath (Daihan), and centrifuge (Centurion Scientific Ltd) (UK).

2.2 Chemical regents

Distilled water was used to prepare the solutions. Ethanol from SHAMLAB (Syria). The standard synthetic colorants were Carmoisine (CI 14720, CAS 3567-69-9) purity 85% and Tartrazine (CI 19140, CAS 1934-21-0) purity 82%. Both colorants were obtained from Sineset (France).

2.3 Standard preparation

Stock solutions (100 μg/mL) of Tartrazine and Carmoisine were prepared by dissolving appropriate weights of pure colorants in distilled water. The working standard solutions of each colorant were prepared by appropriate dilutions of stock solutions with distilled water to give concentrations between 1.2-56 μg/mL of (T) and 1.2-56 μg/mL of (C), taking the purity of the colorants on consideration.

2.4 Calibration Curve

To construct the calibration curve, five standard solutions for each concentration were prepared and the absorbance was measured of each solution five times.

2.5 Sample preparation: Thirteen products were studied:

- 4 g of **Custard Powder Strawberry** sample was accurately weighted and dissolved in mixture of distilled water and ethanol (1:1) v/v, then solution was centrifuged during 15 min. at 5000 rpm for 4 times, then the extracted solution for each time was transferred into a 25 mL volumetric flask and adjusted to volume with the distilled water and ethanol mixture.
- 3 g of **Crème Caramel Strawberry** sample was accurately weighted and dissolved in mixture of distilled water and ethanol (1:1) v/v, then solution was centrifuged during 15 min. at 5000

rpm for 4 times then the extracted solution for each time was transferred into a 25 mL volumetric flask and adjusted to volume with the distilled water and ethanol mixture.

- 2 g of **Cream Chantilly Strawberry** sample was accurately weighted and dissolved in mixture of distilled water and ethanol (1:1) v/v, then solution was centrifuged during 15 min. at 5000 rpm for 4 times then the extracted solution for each time was transferred into a 25 mL volumetric flask and adjusted to volume with the distilled water and ethanol mixture.

- 1 g of homogenized **Cotton Candy (Strawberry)** sample was accurately weighted and dissolved in distilled water, then solution was transferred into a 25 ml volumetric flask and adjusted to volume with distilled water.

- 1 g of homogenized **Silca (Strawberry)** sample was accurately weighted and dissolved in distilled water, then solution was transferred into a 25 ml volumetric flask and adjusted to volume with distilled water.

- Twenty **Diva Candies** pieces (Strawberry) were weighed and crushed. An accurately weighted crushed sample, equivalent to five pieces was dissolved in distilled water, then solution was transferred into 25 mL volumetric flask and adjusted to volume with distilled water.

- **Yellow Diva Candies** lemon flavour were prepared by the same precedent way by weighting crushed sample equivalent to ten pieces, then solution transferred into 25 mL volumetric flask and adjusted to volume with distilled water .

- Five pieces of **Strawberry Chewing-gum** was taken and extracted the colorant by dissolving it in distilled water until removing colorant from gum, then solution was transferred into 25 mL volumetric flask and adjusted to volume with distilled water. The result extract was centrifuged during 15 min at 5000 rpm. Then the supernatant was measured.

- Five pieces of **yellow Chewing-gum** was taken and extracted by the same procedure as a Strawberry Chewing gum.

- 1 g of homogenized **Windmill powder Jelly** lemon flavour sample was accurately weighted and dissolved in distilled water, then solution was transferred into a 25 ml volumetric flask and adjusted to volume with distilled water. The sample solution was centrifuged during 15 min at 5000 rpm. Then the supernatant was measured.
- Twenty red **Samiry Candies** pieces were weighed and crushed. An accurately weighted crushed sample equivalent to one piece was extracted the colorant as a Chewing-gum procedure.

- **Ice Cream (Strawberry)** was melted. 1 mL equivalent to 1.0650 g was transferred into a 10 ml volumetric flask and adjusted to volume with distilled water.

- **Ice Cream (Lemon)** was melted. 1 mL equivalent to 1.0650 g was transferred into a 10 ml volumetric flask and adjusted to volume with distilled water.

3. RESULTS AND DISCUSSION

Absorption spectra of the standard colorants 4 μg/mL (T) and 4 μg/mL (C) solutions were recorded within a wavelength range of 350–600 nm against distilled water, Fig. 3. As can be seen, (C) cannot be determined by direct measurement of absorbance at 516 nm, and (T) cannot too, because of the overlapped spectra. On the other hand, derivative spectrophotometry showed more resolution. Where it made the determination of (T) and (C) mixture possible without pretreatment.The first derivative spectrum at zero-crossing point was used to determine (T) in the presence of (C) at 370 nm (Fig. 4, a).The first derivative spectrum at zero-crossing point was used to determine (C) in the presence of (T) at 570 nm (Fig. 4, b).

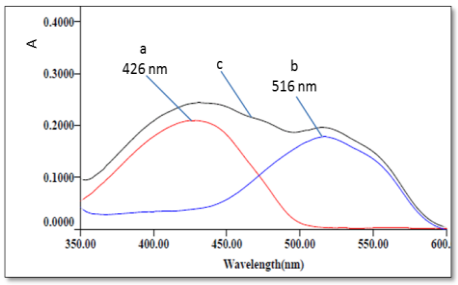

Fig. 3. Zero-order spectra of:
a- (T), b- (C), c- Mixture of (T) + (C).

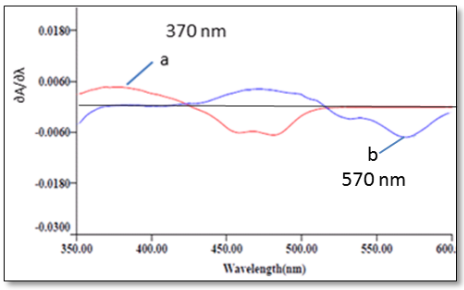

Fig. 4. First derivative spectra of:
a- (T), b- (C).

4. METHOD VALIDATION

The validity of the proposed method was assessed by accuracy (reported as recovery percentage), precision (reported as RSD %), linearity (evaluated by regression equation), limit of detection (LOD) and limit of quantification (LOQ).

4.1 Linearity

The concentration linearity of (T) was in the range 4-40 μg/mL at 370 nm by $^1D_{370}$ Figs 5, 6 and the concentration linearity of (C) was in the range 2-40µg/mL at 570 nm by $^1D_{570}$ Figs. 7, 8.

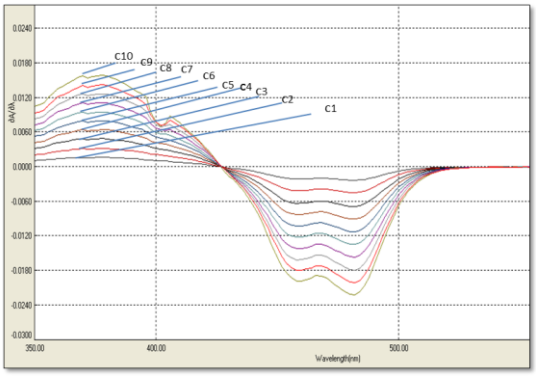

Fig. 5: First derivative spectra of (T):
C_1: 4 μg/mL, C_2: 8 μg/mL, C_3: 12 μg/mL, C_4: 16 μg/mL, C_5: 20 μg/mL, C_6: 24 μg/mL, C_7: 28 μg/mL, C_8: 32 μg/mL, C_9: 36 μg/mL, C_{10}: 40 μg/mL.

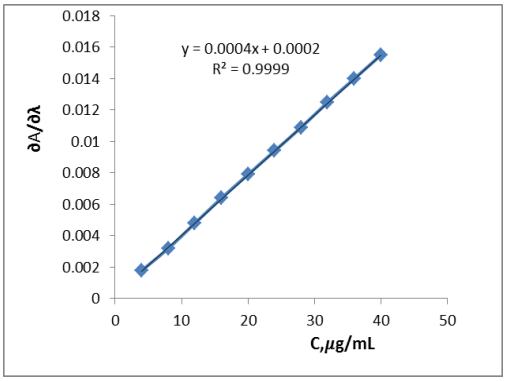

Fig. 6: Calibration curve for (T)
n=5 for each concentration.

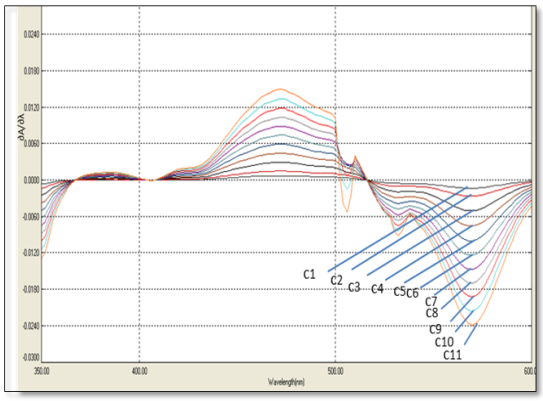

Fig.7: First derivative spectra of (c):
C_1: 2 µg/mL, C_2: 4 µg/mL, C_3: 8 µg/mL,
C_4: 12 µg/mL, C_5: 16 µg/mL, C_6: 20 µg/mL
C_7: 24 µg/mL, C_8: 28 µg/mL, C_9: 32µg/mL,
C_{10}: 36 µg/mL, C_{11}: 40 µg/mL.

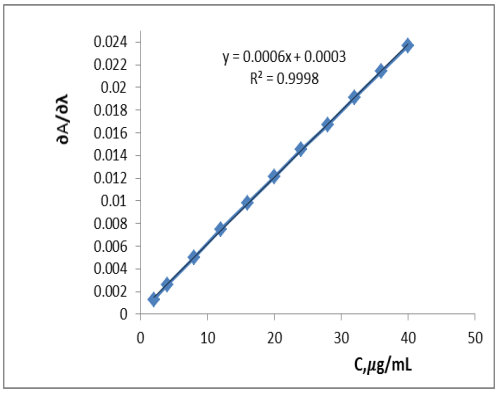

Fig. 8: Calibration curve for (C).
n=5 for each concentration.

4.2 Limit of Detection (LOD) and Limit of Quantification (LOQ):

LOD and LOQ were calculated in Table 1 using the following equations:

$$LOD = \frac{3.3 \times SD}{m}; \quad LOQ = \frac{10 \times SD}{m}$$

Where SD is the standard deviation of y-intercepts of regression lines and m is the slope of the calibration curve.

Table 1: Statistical data for calibration graphs.

Method	Analyte	Selected wavelength (nm)	Linearity rang µg/mL	Correlation coef. (R^2)	LOD µg/mL	LOQ µg/mL
DS	T	$^1D_{370}$	4 - 40	0.9999	0.73	2.23
DS	C	$^1D_{570}$	2 - 40	0.9998	0.30	0.91

4.3 Accuracy and precision:

To determine the precision and accuracy of the proposed methods, five replicate determinations were carried out on three different concentrations of standards (C) and (T). The validation results are shown in Table 2.

Table 2: Method validation for the simultaneous determination of Carmoisine and Tatrazine by the proposed methods.

Method	Colorant	theoretical concentration (µg/mL)	*observed concentration (µg/mL)	Precision (RSD %)	Accuracy (%)
DS	Carmoisine	12	11.90	0.58	99.17
		20	20.10	0.69	100.50
		28	27.97	0.28	99.89

DS	**Tatrazine**	**4**	**4.07**	**2.21**	**101.75**
		12	**12.22**	**1.30**	**101.83**
		28	**27.60**	**0.39**	**98.57**

Accuracy (%) = (observed concentration/theoretical concentration) × 100. Precision (%) = (standard deviation/mean Concentration) ×100. * Five separate determinations were performed and calculated the mean.

5. ANALYTICAL APPLICATION

The developed method was applied for quantitative determination for food colorants in different foodstuffs from Syrian local markets. The samples were prepared as described in the section of samples preparation and analyzed. Quantitative analysis was done by using calibration curves. The obtained results are summarized in Table 3, for thirteen different products.

In general, the used amounts of (C) were relatively higher than those of (T) in all analysed products. However, the concentrations of the detected colorants were much lower than the Syrian limits[17] : 500 mg/kg for (T) and 200 mg/kg for (C).

The relative standard deviations RSD % (n=5) of the quantitative results were in the range of 0.71-3.18 % and 0.24-3.46 % for (T) and (C), respectively. Table 3, a-g present the determination results of colorants (T) and (C), in thirteen Syrian trademarks for five different Batches for each: (Custard Powder Strawberry , Crème Caramel Strawberry, Cream Chantilly Strawberry, Cotton Candy, Yellow chewing-gums, Strawberry chewing-gums, Silca Strawberry, Windmill powder jelly, Lemon and Strawberry Diva ,Samiry candies and Lemon and Strawberry Ice Cream).

Table 3, a: Results of colorants (T) and (C) in Custard Powder (Strawberry) trademark.

No. of sample	Tartrazine			Carmoisine		
	Concentration µg/g	SD µg/g	RSD %	Concentration µg/g	SD µg/g	RSD %
1	45.93	0.85	1.85	196.02	0.47	0.24
2	40.93	1.30	3.18	190.20	3.26	1.71
3	33.30	1.00	3.00	196.21	2.03	1.03
4	32.18	0.85	2.64	193.22	3.34	1.73
5	33.12	0.69	2.08	189.77	4.31	2.27
Range µg/g	32.18 - 45.93			189.77 - 196.21		

Table 3, b: Results of colorants (T) and (C) in Crème Caramel (Strawberry) trademark.

No. of sample	Tartrazine			Carmoisine		
	Concentration µg/g	SD µg/g	RSD %	Concentration µg/g	SD µg/g	RSD %
1	85.41	2.55	2.99	177.46	0.63	0.36
2	74.58	0.93	1.25	183.59	0.59	0.32
3	62.91	1.74	2.77	168.86	4.25	2.52

4	**68.33**	**0.93**	**1.36**	**191.37**	**0.63**	**0.33**
5	**73.33**	**0.93**	**1.27**	**180.79**	**1.15**	**0.64**
Range µg/g	**62.91 - 85.41**			**168.86 - 191.37**		

Table 3, c: Results of colorants (T) and (C) in Cream Chantilly (Strawberry) trademark.

No. of sample	**Tartrazine**			**Carmoisine**		
	Concentration µg/g	**SD µg/g**	**RSD %**	**Concentration µg/g**	**SD µg/g**	**RSD %**
1	**54.37**	**1.71**	**3.15**	**134.10**	**1.90**	**1.42**
2	**50.62**	**1.39**	**2.75**	**157.85**	**0.89**	**0.56**
3	**69.36**	**1.40**	**2.02**	**157.45**	**1.09**	**0.69**
4	**75.62**	**1.39**	**1.84**	**158.65**	**0.96**	**0.61**
5	**96.24**	**1.39**	**1.44**	**176.60**	**0.89**	**0.50**
Range µg/g	**50.62 - 96.24**			**134.10 - 176.60**		

Table 3, d: Results of colorants (T) and (C) in Cotton Candy (Strawberry) trademark.

No. of sample	**Tartrazine**			**Carmoisine**		
	Concentration µg/g	**SD µg/g**	**RSD %**	**Concentration µg/g**	**SD µg/g**	**RSD %**
1	**208.75**	**3.42**	**1.64**	**136.45**	**1.84**	**1.35**
2	**282.50**	**2.79**	**0.99**	**75.80**	**1.78**	**2.35**
3	**383.75**	**3.42**	**0.89**	**54.85**	**1.90**	**3.46**
4	**278.75**	**3.42**	**1.23**	**99.15**	**1.90**	**1.92**
5	**302.50**	**3.42**	**1.13**	**100.80**	**1.78**	**1.77**
Range µg/g	**208.75 - 383.75**			**54.85 - 136.45**		

Table 3, e: Results of colorant (C) in Diva Candy (Strawberry) trademark.

No. of sample	**Tartrazine**			**Carmoisine**		
	Concentration µg/piece	**SD µg/piece**	**RSD %**	**Concentration µg/piece**	**SD µg/piece**	**RSD %**
1	**-**	**-**	**-**	**26.14**	**0.76**	**2.91**
2	**-**	**-**	**-**	**28.78**	**0.71**	**2.47**

3	**-**	**-**	**-**	**31.28**	**0.43**	**1.37**
4	**-**	**-**	**-**	**22.32**	**0.40**	**1.79**
5	**-**	**-**	**-**	**19.90**	**0.22**	**1.11**
Range µg/piece	**-**	**-**	**-**	**19.90 - 31.28**		

Table 3, f: Results of colorant (T) in Diva Candy (Lemon) trademark.

No. of sample	**Tartrazine**			**Carmoisine**		
	Concentration µg/g	**SD µg/g**	**RSD %**	**Concentration µg/g**	**SD µg/g**	**RSD %**
1	**20.24**	**0.53**	**2.62**	**-**	**-**	**-**
2	**20.96**	**0.53**	**2.53**	**-**	**-**	**-**
3	**39.22**	**0.71**	**1.81**	**-**	**-**	**-**
4	**24.74**	**0.58**	**2.34**	**-**	**-**	**-**
5	**35.24**	**0.53**	**1.50**	**-**	**-**	**-**
Range µg/g	**20.24 - 39.22**			**-**	**-**	**-**

Table 3, g: Results of colorant (C) in Samiry Candy (Lemon) trademark.

No. of sample	**Tartrazine**			**Carmoisine**		
	Concentration µg/piece	**SD µg/piece**	**RSD %**	**Concentration µg/piece**	**SD µg/piece**	**RSD %**
1	**-**	**-**	**-**	**90.98**	**0.89**	**0.98**
2	**-**	**-**	**-**	**104.38**	**2.37**	**2.27**
3	**-**	**-**	**-**	**70.96**	**0.87**	**1.23**
4	**-**	**-**	**-**	**79.67**	**0.72**	**0.90**
5	**-**	**-**	**-**	**108.64**	**0.76**	**0.70**
Range µg/piece	**-**	**-**	**-**	**70.96 - 108.64**		

Table 3, h: Results of colorant (C) in Silca Candy (Strawberry) trademark.

No. of sample	**Tartrazine**			**Carmoisine**		
	Concentration µg/g	**SD µg/g**	**RSD %**	**Concentration µg/g**	**SD µg/g**	**RSD %**

1	**-**	**-**	**-**	**20.59**	**0.47**	**2.28**
2	**-**	**-**	**-**	**19.35**	**0.54**	**2.79**
3	**-**	**-**	**-**	**17.89**	**0.47**	**2.63**
4	**-**	**-**	**-**	**16.83**	**0.47**	**2.79**
5	**-**	**-**	**-**	**18.53**	**0.47**	**2.54**
Range µg/g	**-**	**-**	**-**	**16.83 - 20.59**		

Table 3, i: Results of colorant (C) in Chewing-gum (Strawberry) trademark.

No. of sample	**Tartrazine**			**Carmoisine**		
	Concentration µg/ piece	**SD µg/ piece**	**RSD %**	**Concentration µg/ piece**	**SD µg/ piece**	**RSD %**
1	**-**	**-**	**-**	**177.40**	**2.19**	**1.23**
2	**-**	**-**	**-**	**165.70**	**1.78**	**1.07**
3	**-**	**-**	**-**	**110.80**	**2.32**	**2.09**
4	**-**	**-**	**-**	**122.45**	**2.32**	**1.89**
5	**-**	**-**	**-**	**129.85**	**1.90**	**1.46**
Range µg/piece	**-**	**-**	**-**	**110.80 - 177.40**		

Table 3, j: Results of colorant (T) in Chewing-gum (Yellow) trademark.

No. of sample	**Tartrazine**			**Carmoisine**		
	Concentration µg/ piece	**SD µg/ piece**	**RSD %**	**Concentration µg/ piece**	**SD µg/ piece**	**RSD %**
1	**148.75**	**2.79**	**1.88**	**-**	**-**	**-**
2	**170.00**	**2.79**	**1.64**	**-**	**-**	**-**
3	**136.25**	**2.79**	**2.05**	**-**	**-**	**-**
4	**145.00**	**2.79**	**1.92**	**-**	**-**	**-**
5	**127.50**	**3.42**	**2.68**	**-**	**-**	**-**
Range µg/piece	**127.50 - 170.00**			**-**	**-**	**-**

Table 3, k: Results of colorant (T) in Windmill powder Jelly (Lemon) trademark.

No. of	**Tartrazine**	**Carmoisine**

sample	Concentration µg/g	SD µg/g	RSD %	Concentration µg/g	SD µg/g	RSD %
1	310.00	3.42	1.10	-	-	-
2	377.50	3.42	0.91	-	-	-
3	392.46	2.77	0.71	-	-	-
4	389.98	3.39	0.87	-	-	-
5	367.50	2.79	0.76	-	-	-
Range µg/g	310.00 - 392.46			-	-	-

Table 3, l: Results of colorant (C) in Ice cream (Strawberry) trademark.

No. of sample	Tartrazine			Carmoisine		
	Concentration µg/g	SD µg/g	RSD %	Concentration µg/g	SD µg/g	RSD %
1	-	-	-	67.86	0.87	1.28
2	-	-	-	63.82	0.72	1.13
3	-	-	-	59.11	0.71	1.20
4	-	-	-	48.76	0.71	1.46
5	-	-	-	55.69	0.87	1.56
Range µg/g	-	-	-	48.76 - 67.86		

Table 3, m: Results of colorant (T) in Ice cream (Lemon) trademark.

No. of sample	Tartrazine			Carmoisine		
	Concentration µg/g	SD µg/g	RSD %	Concentration µg/g	SD µg/g	RSD %
1	67.60	1.05	1.55	-	-	-
2	65.05	1.03	1.58	-	-	-
3	66.19	1.05	1.59	-	-	-
4	74.17	1.28	1.73	-	-	-
5	71.35	1.28	1.79	-	-	-
Range µg/g	65.05 - 74.17			-	-	-

Recovery:

The recovery was studied by three addition standards for every product. Table 4 presents the recoveries results for the thirteen products studied.

Table (4): Recoveries for the thirteen products:

Product	Colorant	Sample µg/mL	Added µg/mL	Total Found µg/mL	Recovery %	SD µg/mL	RSD %	Recovery Average %
Custard Powder Strawberry	**T**	7.35	4	11.35	100.00	3.39	3.39	**101.73**
		7.35	6	13.55	103.33	1.83	1.77	
		7.35	8	15.50	101.88	2.20	2.16	
	C	15.42	2.5	17.91	99.60	0.35	0.35	**100.80**
		15.42	5	20.56	102.80	1.36	1.32	
		15.42	7.5	22.92	100.00	1.09	1.09	
Crème Caramel Strawberry	**T**	8.8	4	12.80	100.00	3.13	3.13	**100.41**
		8.8	6	14.80	100.00	3.49	3.49	
		8.8	8	16.90	101.25	1.71	1.69	
	C	21.69	5	26.76	101.40	1.89	1.86	**100.93**
		21.69	10	31.69	100.00	1.80	1.80	
		21.69	12	33.86	101.41	0.65	0.64	
Cream Chantilly Strawberry	**T**	4.05	4	8.10	101.25	2.70	2.67	**101.59**
		4.05	6	10.15	101.66	2.28	2.24	
		4.05	8	12.20	101.87	1.39	1.36	
	C	12.62	4	16.62	100.00	1.78	1.78	**100.12**
		12.62	6	18.59	99.50	1.45	1.46	
		12.62	8	20.69	100.88	0.94	0.93	
Cotton Candy	**T**	12.10	4	16.15	101.25	3.28	3.23	**101.59**
		12.10	6	18.05	99.17	1.75	1.76	
		12.10	8	20.45	104.38	1.41	1.35	
	C	4.03	4	8.12	102.25	1.78	1.74	**100.36**
		4.03	6	9.96	98.83	1.27	1.29	
		4.03	8	12.03	100.00	0.89	0.89	
Yellow Chewing-gums	**T**	5.10	4	9.05	98.75	2.79	2.83	**100.97**
		5.10	6	11.20	101.67	1.86	1.83	
		5.10	8	13.30	102.50	1.62	1.58	
	C	-	-	-	-	-	-	**-**
		-	-	-	-	-	-	
		-	-	-	-	-	-	
Strawberry chewing-gums	**T**	-	-	-	-	-	-	**-**
		-	-	-	-	-	-	
		-	-	-	-	-	-	
		5.19	4	9.29	102.50	1.90	1.85	

		5.19	6	11.26	101.17	1.55	1.53	**101.63**
		5.19	8	13.29	101.25	0.95	0.94	
Silca Strawberry	**T**	-	-	-	-	-	-	**-**
		-	-	-	-	-	-	
		-	-	-	-	-	-	
	C	2.96	4	6.96	100.00	1.90	1.90	**99.02**
		2.96	6	8.86	98.33	1.63	1.66	
		2.96	8	10.86	98.75	0.95	0.96	
Windmill powder Jelly	**T**	14.70	4	18.80	102.50	2.79	2.72	**100.97**
		14.70	6	20.65	99.17	0.11	0.11	
		14.70	8	22.80	101.25	1.39	1.37	
	C	-	-	-	-	-	-	**-**
		-	-	-	-	-	-	
		-	-	-	-	-	-	
Strawberry Diva	**T**	-	-	-	-	-	-	**-**
		-	-	-	-	-	-	
		-	-		-	-	-	
	C	3.96	4	8.03	101.75	1.78	1.75	**100.58**
		3.96	6	9.96	100.00	1.26	1.26	
		3.96	8	11.96	100.00	0.95	0.95	
Lemon Diva	**T**	4.05	4	8.11	101.50	3.42	3.37	**100.50**
		4.05	6	10.05	100.00	1.86	1.86	
		4.05	8	12.05	100.00	1.39	1.39	
	C	-	-	-	-	-	-	**-**
		-	-	-	-	-	-	
		-	-	-	-	-	-	
Samiry Candies	**T**	-	-	-	-	-	-	**-**
		-	-	-	-	-	-	
		-	-	-	-	-	-	
	C	7.09	4	11.26	104.25	2.32	2.23	**102.26**
		7.09	6	13.22	102.17	2.53	2.48	
		7.09	8	15.12	100.38	0.89	0.89	
Strawberry Ice Cream	**T**	-	-	-	-	-	-	**-**
		-	-	-	-	-	-	
		-	-	-	-	-	-	
	C	5.19	4	9.22	100.75	2.32	2.30	**100.34**
		5.19	6	11.29	101.67	1.26	1.24	
		5.19	8	13.12	99.13	0.83	0.84	
	T	7.90	4	12.05	103.75	2.79	2.69	
		7.90	6	14.10	103.33	2.28	2.21	

Cream		7.90	8	16.20	103.75	3.42	3.29	**103.61**
	C	-	-	-	-	-	-	**-**
		-	-	-	-	-	-	
		-	-	-	-	-	-	

6. CONCLUSIONS

Tartrazine (T) and Carmoisine (C) levels were estimated in individual form and in their mixtures in different studied local foodstuffs by simple spectrophotometric method. (C) and (T) were determined by first derivative spectrophotometric method using zero-crossing point.

Colorants levels were lower than their maximum values which established by the Syrian legislation[17]. The proposed method of (T) and (C) determination are accurate, simple, sensitive, easy and directly applicable in quantitative analysis without previous chemical treatment in individual or binary mixture.

The proportions of mixture of (T) and (C) in the studied products were different from one to another. It was seen also that Carmoisine level in general was higher than Tartazine in all analyzed products.The food additives in the different studied products didn't have any interferences on the analysis of the Tartrazine (T) and Carmoisine (C).

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REFERENCES

[1] Vidotti EC, Costa WF, Oliveira CC. Development of a green chromatographic method for determination of colorants in food samples. Talanta 2006; 68: 516-521.
[2] Li R, Tao Jiang Z, Hao Liu Y. Direct solid-phase determination of tartrazine in soft drinks using β-cyclodextrin polymer as support. J Food Drug Anal 2008; 16: 91-96.
[3] Pérez-Urquiza M, Beltrán JL. Determination of dyes in foodstuffs by capillary zone electrophoresis. J. Chromatogr A 2000; 898: 271-275.
[4] Combeau S, Chatelut M, Vittori O. Identification and simultaneous determination of azorubin, allura red and ponceau 4R by differential pulse polarography: application to soft drinks. Talanta 2002; 56: 115-122.
[5] Chanlon S, Joly- Pottuz L, Chatelut M, Vittori O, Cretier JL. Determination of carmoisine, allura red and ponceau 4R in sweets and soft drinks by differential pulse polarography. J Food Comp Anal 2005; 18: 503-515.
[6] Yongnian Ni, Jieling B, Ling J. Multicomponent chemometric determination of colorant mixtures by voltammetry. Anal lett 1997; 30: 1761-1777.
[7] Dinc E, Aktas A, Baleanu D, Üstündag Ö. Simultaneous determination of tartrazine and allura red in commercial preparation by chemometric HPLC method. J. Food Drug Anal 2006; 14: 284-291.
[8] Chen Q, Mou S, Hou X, Riviello JM, Ni Z. Determination of eight synthetic food colorants in drinks by high-performance ion chromatography. J. Chromatogr A 1998; 827: 73-81.
[9] Oka H, Ikai Y. Kawamura N, Yamada M, Inoue H, Ohno T, Inagaki K, Kuno A, Yamamoto N. Simple method for the analysis of food dyes on reversed-phase thin-layer plates. J. Chromatogr A 1987; 411: 437-444.
[10] Minioti K, Sakellariou C, Thomaidis N. Determination of 13 synthetic food colorants in water-soluble foods by reversed-phase high-performance liquid chromatography coupled with diode-array detector. Anal Chim Acta 2007; 583: 103-110.
[11] Yoshioka N, Ichihashi K. Determination of 40 synthetic food colors in drinks and candies by high-performance liquid chromatography using a short column with photodiode array detection. Talanta 2008; 74: 1408–1413.

[12] Thompson C, Craige Trenerry V. Determination of synthetic colours in confectionery and cordials by micellar electrokinetic capillary chromatography. J. chromatogr A 1995; 704: 195-201.
[13] Ni Y, Gong X. Simultaneous spectrophotometric determination of mixtures of food colorants. Anal Chim Acta 1997; 354: 163-171.
[14] Özgür M. A rapid spectrophotometric method to resolve a binary mixture of food colorants (riboflavine and sunset Yellow). Turk J Chem 2004; 28: 325-333.
[15] Altinoz S, Toptan S. Simultaneous determination of indigotin and ponceau-4R in food samples by using vierordt's method, ratio spectra first order derivative and derivative UV spectrophotometry. J Food Comp Anal 2003; 16: 517–530.
[16] Berzas JJ, Rodríguez Flores J, Villaseñor Llerena MJ, Rodríguez Fariñas N. Spectrophotometric resolution of ternary mixtures of tartrazine, patent blue V and indigo carmine in commercial products. Anal Chim Acta 1999; 391: 353-364.
[17] Syrian Arab organization for standardization and metrology, SNS 770 (1996).