

PRODUCTION OF ANTHOCYANINS FROM POMPOZIA FRUITS

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(Manuscript received 26 Aug., 1999)

Abstract

This work was carried out to extract, identify, determine and utilize the natural red pigments from Pompozia fruits as natural red colorants instead of the artificial colorants which proved to be harmful and unsafe to human health. The obtained results reveal that anthocyanins were the main and predominant pigments existing in Pompozia fruits. Five components of anthocyanins were identified in this study, they were petunidin, delphindin, cyanidin, pelargonidin and malvidin. It was also ascertained through this study that utilization of the separated natural red pigments as natural colorants for Rayeb milk and Jelly was very palatable among panelists, also the natural red colorant was stable with no pronounced decrease during storage of the aforementioned colored food products at 4° C for seven days. The anthocyanins content in Pompozia fruits was 906.82 mg /100 g Pompozia fruits (on dry weight basis).

INTRODUCTION

Anthocyanins are among the best known natural pigments, being responsible for the blue, purple, violet and red color of the majority of plant species and their products. They are glycosides combining with sugars. Within the recent years, the natural coloring matters are needed to replace the artificial ones which proved to be unsafe to human health.

Pompozia fruits are among the plants rich in red color, these aforementioned fruits are not widely consumed either fresh or in processed forms in Egypt. Markakis (1982) demonstrated that anthocyanins were easily extracted by using aqueous solvent systems.

Abdalla *et al.* (1989) reported that anthocyanins were easily oxidized or reduced by heat, acids and enzymes. They also added that minimum heat caused degradation in red color of anthocyanins. It has been established by many investigators that anthocyanins are altered in color by changes of pH and this can serve as indicators (Newsome, 1990 and Hendry, 1991). This study aims to make use of, Pompozia fruits which are

not widely known or consumed in Egypt by the extraction of the natural red pigments as well as identification and determination of the extracted pigments and finally utilization of the extracted red pigments as natural colorants instead of the synthetic ones.

MATERIALS AND METHODS

A. Materials:

Mature Pompozia fruits were harvested at the Horticultur Research Institute, Agric., Res. Center, Giza in September (1997).

B. Methods:

1- Extraction of natural red pigments:

The natural red pigments were extracted from Pompozia fruits with (2% citric acid solution) as described by Du *et al.*, (1975).

2- Identification of natural red pigments:

2.1. Color measurement:

The ultraviolet spectrophotometer Unicam " Sp1800" was used for the identification of the natural red pigments. The absorbance (A) was measured at wavelengths ranging from 500 to 570 at intervals of 2 nm.

2.2. Identification by some rapid qualitative tests:

The natural red pigments extracted from Pompozia fruits were identified qualitatively according to the methods described by Ranganna (1977) through oxidation test, ferric chloride test and Fehling solution test.

2.3. Paper chromatography:

Anthocyanin components of natural red pigments extracted from Pompozia fruits were identified using paper chromatography as described by Harborne (1976) where the ascending technique was used with Whatman paper No.4.

3- Determination:

Total content of anthocyanin pigments in the fresh Pompozia fruits was determined according to Ranganna (1977).

4- Moisture content in Pomposia fruits:

Moisture content was determined according to A.O.A.C. (1990).

5- Utilization of natural red pigments as colorants:

The natural red pigments extracted from Pomposia fruits were utilized as natural colorants for both Rayeb milk and Jelly as follows:

5.1. Coloration of Rayeb milk:

Rayeb milk (rose color) was purchased from local market as control, Rayeb milk (White) was obtained from Dairy processing department in the Food Technology Res. Institute, A.R.C., Giza and divided into three portions and treated as follows:

- a. To the first portion (50ml), 1 cm of natural red pigments extract was added.
- b. To the second portion (50ml), 3 cm of natural red pigments extract was added.
- c. To the third portion (50ml), 5cm of natural red pigments extract was added.

5.2. Production of Jelly colored with natural red pigments

Ingredients used for processing Jelly:

Gelatin	18 parts
Citric acid	3 parts
Sugar	125 parts
Fruit essence	1 parts
Water	73 parts

Procedure:

After boiling water, all the aforementioned ingredients were poured together, then cooled. The mixture was divided into 3 equal portions where three concentrations of natural red pigments extracted from Pomposia fruits (1,3 and 5 cm) were added to the three equal portions separately. Ready processed Jelly (with red color) was purchased from the local market as control.

Organoleptic evaluation:

Sensory evaluation for "color, taste, odor and texture" of both Rayeb milk and Jelly (control and samples colored with natural red pigments) was performed by ten panelists.

Statistical analysis:

Statistical analysis of the organoleptic evaluation was performed according to Larmond (1970).

Effect of storage on color stability:

Effect of cold storage (at 4° C) on stability of color of the aforementioned samples of both Rayeb milk and Jelly was studied by measuring the color intensity of those samples every day up to seven days. This measurement was performed as described by Fuleki and Francis (1968).

RESULTS AND DISCUSSION**1. Identification of the natural red pigments extracted from Pompozia fruits:****1. Spectrophotometric analysis:**

Maximum absorbances for the natural red pigments extracted from Pompozia fruits are shown in Table 1 and illustrated in Fig (1), it could be noticed that the maximum absorbance was at wavelength ranging from 515 to 540 nm. These results were in agreement with Sallam *et al.* (1996) who found that maximum absorbance of anthocyanins were ranging from 510 to 545 nm, accordingly, it could be concluded that the natural red pigments extracted from Pompozia fruits were anthocyanins.

2. Some rapid qualitative tests:

The main components of anthocyanins extracted from Pompozia fruits are shown in Table 2. These anthocyanin components were petunidin, delphindin, cyanidin, pelargondin and malvidin.

3. Paper chromatography:

From Table 3, it could be observed that the R_f values of anthocyanin components petunidin, delphindin, cyanidin, pelargondin and malvidin in the tested sample were similar to those reported by Harborne (1976). Minor differences could be mainly due to temperature variation. However, color spots for all mentioned components were similar to those reported by Harborne (1976).

II. Anthocyanin content:

From Table 4, it could be observed that the moisture content of Pompozia fruits was 91.52% and the content of anthocyanin in Pompozia fruits was 906.82mg/100g Pompozia fruits (on dry weight basis). These results were in agreement with Abd El-Latif *et al.*, (1992), who determined anthocyanin content in Pompozia fruit by measuring the maximum absorbance at wave lengths from 515 to 540 nm.

III. Utilization of natural red Pigments extracted from Pompozia fruits as natural colorants:

Data concerning the evaluation of utilizing the natural red pigments extracted from Pompozia fruits as natural colorants for Rayeb milk and Jelly are given in Tables 5 and 6 respectively. From Table 5, it could be noticed that the addition of the extracted natural pigments to Rayeb milk in a concentration of 3 cm /50 ml gave the highest scores of palatability for color, taste, odor and texture while the concentration of 5 ml/ 50 ml gave the least scores compared to the control.

Regarding the jelly color, it could be observed from table 6 that the most palatable and preferable concentration of added natural colorant to the Jelly was 3 cm/50 ml of Jelly while the concentration of 1 cm / 50 ml gave the least scores of palatability for color, taste, odor and texture compared to the control.

2. Stability of color of natural red pigments:

From Table 7, it could be found that the color intensity of Rayeb milk colored with 3 cm / 50 ml (the most preferable concentration among panelists) and the color intensity of Jelly colored with 3 cm/50 ml (the most preferable concentration) were subjected to no pronounced decrease during storage for up to seven days at 4° C. These results were in agreement with those reported by Sallam *et al.* (1996).

Finally, it could be concluded that extraction of natural red pigments from Pompozia fruits with acidified water will be performed with very little cost. So, it is successful and economical to make use of those aforementioned fruits by the utilization of their separated red pigments as natural colorants for different foods instead of the artificial ones which may be harmful and unsafe to human health.

Table 1. Absorbances of natural red pigments extracted from Pompozia fruits at different wavelenths (nm).

Wavelength (nm)	Absorbance	Wavelength (nm)	Absorbance
500	0.12	536	0.680
502	0.17	538	0.710
504	0.175	540	0.790
506	0.185	542	0.82
508	0.240	544	0.88
510	0.260	546	0.810
512	0.320	548	0.670
514	0.360	550	0.510
516	0.390	552	0.480
518	0.530	554	0.410
520	0.690	556	0.320
522	0.670	558	0.220
524	0.620	560	0.180
526	0.570	562	0.160
528	0.510	564	0.120
530	0.550	566	0.100
532	0.610	568	0.08
534	0.650	570	0.02

Table 2. The main anthocyanins components in Pompozia fruits (by rapid qualitative tests).

Anthocyanins components	• Rapid qualitative test				
	Oxidation test (loss in red color)	Ferric chloride test (bright blue color)	Fehling test (removal of blue color)		
			Cold	Warm	Boiling
Petunidin	+	-	-	-	-
Delphindin	+	-	+	-	-
Cyanidin	-	+	+	-	-
Pelargondin	-	-	-	+	-
Malvidin	-	-	-	-	+
Peonidin	-	-	-	-	-

• : + = : Means presence of component.

- = : Means absence of component.

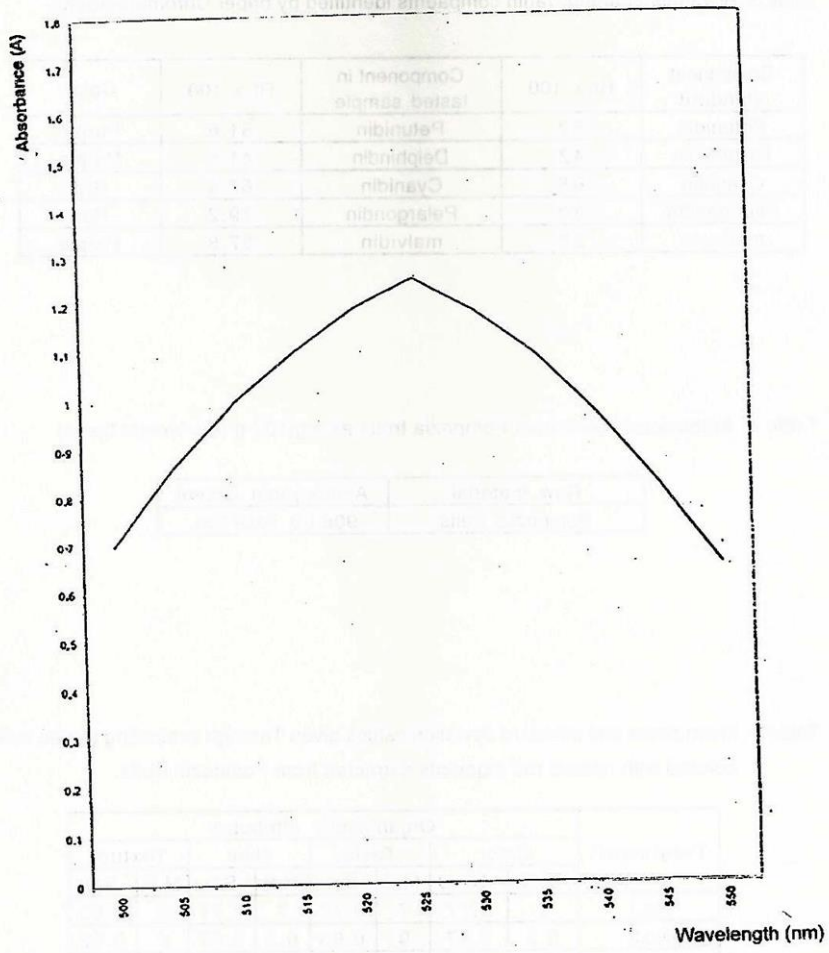


Fig 1. Qualitative spectra of natural red pigments extracted from Pompozia fruits with acidified water.

Table 3. R_f values of anthocyanin components identified by paper Chromatography

Component standard	R _f x 100	Component in tasted sample	R _f x 100	Color
Petunidin	52	Petunidin	51.6	Purple
Delphindin	42	Delphindin	41.5	Purple
Cyanidin	68	Cyanidin	67.9	Red
Pelargondin	80	Pelargondin	79.2	Red
malvidin	58	malvidin	57.8	Purple

Table 4. Anthocyanin content in Pompozia fruits as mg/100 g (dry weight basis)

Raw material	Anthocyanin content
Pompozia fruits	906.82 MG/100,

Table 5. Mean score and standard deviation values given through evaluating Rayeb milk colored with natural red pigments extracted from Pompozia fruits.

Treatment*	Organoleptic attributes							
	Color		Taste		Odor		Texture	
	•M.S.	**S.D	M.S	S.D	M.S	S.D	M.S	S.D
No.1	7	0.77	7	0.77	7	0.77	9	0.63
No.2	9.5	0.67	9	0.63	9.5	0.67	9	0.63
No.3	7.5	0.81	7.5	7.5	7	0.77	9	0.63
No.4	8	0.77	8.5	8.5	8.5	0.81	9	0.63

*Treatments:

No. 1: Rayeb milk colored with natural red pigments (1 cm/ 50 cm)

No. 2: Rayeb milk colored with natural red pigments (3 cm/ 50 cm)

No. 3: Rayeb milk colored with natural red pigments (5 cm/ 50 cm)

No. 4: Control (purchased from local market) colored with artificial colorant as written on its label.

• M.S: Mean score

** S.D: Standard deviation

Table 6. Mean score and standard deviation values given Through evaluating Rayeb milk colored with natural red pigments extracted from Pompozia fruits.

Treatment*	Organoleptic attributes							
	Color		Taste		Odor		Texture	
	•M.S.	**S.D	M.S	S.D	M.S	S.D	M.S	S.D
No.1	6	0.77	6	0.77	6	0.77	8	0.77
No.2	9	0.63	9	0.63	8.5	0.77	8	0.77
No.3	7	0.77	7	0.77	7	0.77	8	0.77
No.4	8	0.77	8.5	0.81	8.5	0.81	8	0.77

*Treatments:

No. 1 : Jelly colored with natural red pigments (1 cm/ 50 cm)

No. 2 : Jelly colored with natural red pigments (3 cm/ 50 cm)

No. 3 : Jelly colored with natural red pigments (5 cm/ 50 cm)

No. 4 : Control (purchased from local market) colored with artificial colorant as written on its lable.

• M.S: Mean score

**S D: Standard deviation

Table 7. Effect of storage at 4° C on color intensity of Rayeb milk colored with natural red pigments extracted from Pompozia fruits.

Storage period in days	Color intensity at 3535 (nm)	
	Reyeb milk	Jelly
0	0.755	0.952
1	0.733	0.918
2	0.722	0.897
3	0.698	0.886
4	0.672	0.875
5	0.668	0.868
6	0.662	0.861
7	0.653	0.858

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إنتاج الأنثوسيانين من ثمار البمبوزيا

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أجري هذا البحث بغرض الاستخلاص والتعرف والتقدير للصبغات الحمراء في ثمار البمبوزيا بالإضافة إلى دراسة إمكانية استخدام تلك الصبغات المفصولة كملون طبيعي لبعض الأغذية مثل اللبن الرايب والجيلي وقد أثبتت النتائج المتحصل عليها أن الصبغات السائدة في ثمار البمبوزيا هي صبغات الأنثوسيانين كما أمكن التعرف بالوسائل المختلفة على خمس مركبات للأنثوسيانين المفصول وهي البتيونيدين، دلفندين، سيانيدين، بيلارجونيدين، والمالفيدين وكان محتوى ثمار البمبوزيا من صبغات الأنثوسيانين حوالى ٩٠.٦٨٢ مليجرام / ١٠٠ جرام ثمار (على أساس وزن جاف) كما أثبتت الدراسة إمكانية استخدام الصبغات المفصولة في تلوين اللبن الرايب والجيلي بدلاً من الألوان الصناعية الضارة بالصحة كما ثبت أن اللون الأحمر الطبيعي ظل ثابتاً ولم يتدهور خلال فترة تخزين المنتجات الملونة به على درجة حرارة ٤°م.