



# Isolation of natural dyes from Sugar (Beta Vulgaris) and Cinnamon (Cinnamon) and used acid - base natural indicators

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## ABSTRACT

In this research, isolated group of natural pigments of vegetarian cinnamon, sugar (Beta Vulgaris), and used extracts as indicator acid - base were compared with common indicators, such as methyl orange and phenolphthalein, and the results showed a consensus in the extent of the change chromatography was used as extracts to prepare papers chromatography paper (PC) is similar to the leaves Sunflower (litmus paper). And the study of the infrared spectrum of the active substances isolated from vegetable, sugar (Beta Vulgaris) and cinnamon.

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## Introduction

Increased attention in recent years with natural pigments extracted from plants because they are safer for use in all areas of pigments prepared by chemical methods. The credit for the discovery of signs of acid - base back to the world Robert Royal (Robert Royal) when he noticed the disappearance of blue color of the plant Trinity (lignum Nephriticum) in hard water when you add acid to it and return blue color when you add drops of carbonate sodium (1). Continued the process of discovery of natural dyes and use acid - base indicator use of all plant parts as flowers, leaves and fruits, especially empty on the color red, purple and blue a return to the group compounds flavonoids called (Anthocyanines), which changes color change function garrison (2). And Anthocyanines are dyes are dissolved in the water found in the sap of plant cells and earn fruits and vegetables multiple colors from orange to blue, and are found in plants in the form of Claicosadat any (part organic anthocyanin and part diabetes) and are separated by the diabetes degradation aqueous acid (2), and is part Organic is responsible for the color of the dye, the factors affecting the pigments in general when extracted from the plant is the duration of storage, temperature and enzymes, light and dissolved oxygen in the water and acid and high factors formation of complexes (phenols and metallic elements) and sulfur dioxide (3).

Contains a sugar (Beta Vulgaris) plant in the chemical composition on the calories, protein, fat, carbohydrates, fiber and minerals (calcium, iron, sodium), vitamins (K, beta carotene, riboflavin and niacin) acid and ascorbic. As contains lysine and tryptophan, one of the essential amino acids, alanine and Phenyl alanine, tyrosine, glutamic acid, glutamine and five other amino acids. It also contains essential oil with varmenol (5).

The chemical composition of the plant cinnamon (7) includes many of the vehicles and the most important of tannins and volatile oils cenamaldihyde named Cinnamon oil, which is attributed to more pharmacological effects and composite second eugenol due to sedative effect and composite sinamel Estate and Sanmayl alcohol and acid, cinnamon also contains cobalt materials and terpinenes and gel materials, sugar and starch

materials and contents are similar in both Chinese cinnamon and cylan (8).

### Working methods:

#### First: - Plants used in the search

1- plant classification: Use the search in the sugar and cinnamon, which was obtained from the local market in Anbar province.

2- Prepare plant for the study: the use of sugar and cinnamon, which was purchased from one of the local markets of the city of Fallujah, sugar was cleaned well by water were then cut into small pieces and dried, and then grinding cinnamon and sugar, dried and stored until use.

#### Second: - The materials and methods of work of the water extraction and isolation of dye plants:

Weight (50) grams of powdered sugar and added to it (50) ml (70% methanol) and then heated using a continuous extraction for a period of 6 hours and a temperature (40-60) C°. The resulting solution is then evaporated under pressure by a rotary evaporator temperature (40) C° and then put the resulting solid material which represents flavonoids in dark bottle sealed and stored until use. (9,10)

Returned way above the cinnamon to get material brown color amorphous weighing 2.5 grams.

#### Third: - chemical study (qualitative statements)

For the purpose of identifying the components of the sugar and cinnamon conducted several coupes chemical quality of the initial extract and cinnamon beet as follows:

A - Detection of Alkaloids (11)

B - Detection of Carbohydrates

C - Detection of Saponin (12)

D - Detection of Flavonoids (12)

E - Detection of fat Lipids (11)

F- Proteins

G - amino acids

H - Tannins

1- Lead acetate reagent (13): The emergence of light brown precipitate a sign of the presence of these tannins.

2- Ferric chloride reagent (14): The emergence of green or dark blue indicate the existence of a Catechol.

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3- Potassium carbonate reagent (13): The emergence of red precipitate a sign of the presence of these tannins.

4- Formaldehyde detector (14): The emergence of brown precipitate an indication of a catechol. Appearance of thick white precipitate an indication of a Pyrogallol group.

5- pH acidity detection (13): If the pH value ranging from (6.3 to 9.5) indicates that the presence of intense tannins.

6- Detection of Locoanthocyanidine (13): red color denote the precipitate the presence of Locoanthocyanidine.

7- Detection of Gelatin (14): This reagent is used to detect the tannins in general, the appearance of brown precipitate - milky evidence of the presence of tannins.

#### Fourth: the appropriate test solvent dyes:

Been test solubility pigments used in each of the following solvents: ethanol, water, methanol, acetone, DMSO, 70% ethanol. Where solve the 0.01 g of pigments isolated dissolved in 10 ml of the solvents mentioned and recorded as a result of melting immediately after the passage of 24, 48 and 72 hours.

#### Fifth: The effect of temperature on pigments

After testing the appropriate solvent above, Preparation of isolated pigments solution of plants in distilled water at a concentration (0.05 g in 20 ml) and the color change has been observed with the temperature range 30-70 C°.

#### Sixth : The effect of the acidic function on the color stability of Pigment

Three solutions of pigments were prepared, concentrations equal (0.03 g dissolved in 10 ml) ,pH of the solution first at pH = 1 using hydrochloric acid concentration of 2 Molar and the solution is second at pH = 7 using buffer solution organizer and liquor third at pH = 12 by adding sodium hydroxide concentration 2 Molar, color changes were recorded in the three solutions than 24 hr. after 48 hours and 72 hours.

#### Seventh: test scalability tints on of chromatography climate change pH values:

The weight of 0.5 g of the dye resulting from the sugar plant in the flask and added to 20 ml of distilled water was added Had 1 Molar hydrochloric, 1 Molar sodium hydroxide for different pH values , observed color change of the solution with acidic function values. repeating the above method to other dye obtained from the cinnamon.

#### Eighth: compare isolated tints with some signs of acid - base:

Isolated pigments were compared with some acid - base indicators known and available namely phenolphthalein , methyl orange:

1-Compared with manual methyl orange : hydrochloric acid were calibrated with a standard solution of sodium carbonate initial 0.1 Molar using two drops of evidence the orange then returned instance process using six drops of each of pigments isolated of sugar and cinnamon.

2-Compared with tints manual phenolphthalein sodium hydroxide were calibrated with hydrochloric acid concentration 0.09 Molar using two drops of Guide phenolphthalein and returned process using six drops of each of pigment isolated of plants sugar and cinnamon.

#### Ninth: the use of dyes in aqueous extract of paper measuring acid - base:

Blending 15 g of powdered fruits of sugar with 100 ml of 5% acetic acid, leaving the mixture for 24 hours with constant stirring motor magnetic at room temperature. Nominated mix and concentrated to a volume of 30 ml by rotary evaporator under pressure the temperature 50 C° then divided into two parts equal mix:

**Section I:** put the number of nomination papers type (Whatmann No.1), which is designed rectangles dimensions (1X6) cm for 30 minutes, then dried and left for later use.

**Section II:** from the concentrated solution was added to 5 ml of sodium hydroxide 2 Molar then and has developed a number of nomination papers and the same to stay away and leave it for the same duration then drained and left for later use.

#### Results and discussion:

##### Chemical statements:

Table 1 shows the chemical statements of material effective in the sugar and cinnamon, discoveries have shown presence of important varieties of vehicles.

**Table (1): Results of chemical statements for effective materials in the sugar and cinnamon**

No.	Active Compounds	Reagents	Indicators	Result	
				sugar	cinnamon
1	Alkaloids	Dargendrof	orange	+	+
2	Tannins	Ferric chloride, Lead acetate	Green-blue solution Gelatinous ppt.	+	+
3	Intense Tannins	lead acetate	precipitate Light Brown	+	+
4	Flavonoids	ammonia solution	Yellow solution	+	+
5	Amino acids	Alnnhidran	purple	+	+
6	Phenols	potassium ferrocyanide	Greensh - blue ppt.	+	+
7	Resins	hydrochloric acid	turbid	-	-
8	Terpenoids	Salkowski	dark red	+	+
9	Saponins	mercury chloride	white precipitate	+	+
10	Carbohydrates	Alfa-naphthol	Purple	+	+
11	Loco anthocyanedin	hydrochloric acid	precipitate red	+	+
12	Steriods	The same of Terpnoids reagent after one day	Blueish solution	+	+
13	Glycosides	Benedict	red precipitate	+	+

(+) indicate the positive test

(-)indicate the positive test

#### Choosing the right solvent:

Noted that the pigments isolated from plants have high color stability in 70% ethanol and water while the rest of the solvent has been observed color tints change over time.

#### The effect of temperature on the isolated pigments:

After testing the appropriate solvent dyes have been testing the stability of these pigments to the temperature change has shown a good stable dyes for use as evidence in laboratory conditions it did not happen during the heating of 30-70 C° change Chromatic Senior hampering be used as evidence.

#### The effect of the acidic function on the stability of dyes:

Of the results of the study shows that the isolated pigments from plants in the middle stable acidic pH = 1 as stayed retaining color and its ability to change color for 48 hours and this corresponds with the literature (15).

#### Test dyes chromatography change with the changing values of the acidic pH :

Shown in Table (2) The isolated pigments have the same color change with the changing values of the function as acidic color change from red to violet when the value of pH = 5-6 and

then from violet to yellow at pH = 10-11 This is consistent with the literature (16).

**Table (2): color change with the change of dyes acid function**

Plant	function acidic	color
Sugar	5-1	Red
	10-6	Violet
	12-11	Yellow
Cinnamon	5-1	Orange
	10-6	Brown
	12-11	Dark brown

#### Test with some indicators:

When calibration hydrochloric acid 0.09 Molar with lotion record initial sodium carbonate 0.1 Molar using manual instance orange pigments found that there is a consensus-sized acid used for ten replicates where average size 10.3 for instance orange and 10 ml of the dye and the margin of error is 3.1% when using the acid standard with NaOH 0.1 Molar using phenolphthalein Guide glory There is also a consensus for ten replicates size where size using phenolphthalein the rate 59 ml and 5 ml 8 using the dye and the margin of error is 2.95% for these dyes can be nominated as acid - base indicator and successfully.

#### The results of the use of isolated dyes to form paper pH :

Has been testing the nomination papers that have been treated with plant extracts, where it was observed that all the papers that have been submerged reduce saturation extracts have a color in the same color of the pigment isolated from sugar and cinnamon notes color change in the solution of acid and base and through this experience we get the papers like leaves sunflower litmus paper which is highly efficient to know the nature of acidic and basic solutions when dipped in these solutions have been using this method according to the literature (17).

#### The results of the use of dyes on some acidic and basic solutions:

Has been testing a number of solutions pH which has been treated with plant extracts, where it was noted that all may change color in the solution of acid and base, as in the table (3) It is highly efficient to know the nature of the pH of the solutions when dipped in the solution has been used This method according to the literature (18).

**Table 2: Change the color of dyes with acidic change the function of laboratory solutions**

Reagents	hydrochloric acid	acetic acid	nitric acid	sodium hydroxide	potassium hydroxide	hydroxide Ammonium
Sugar	+	+	+	+	+	+
Change the color	Violet	Violet	Violet	Yellow	Yellow	Yellow
Cinnamon	+	+	+	+	+	+
Change the color	orange	orange	orange	Dark Brown	Dark Brown	Dark Brown

#### Spectral study of the infrared rays isolated compounds:

The measurements of the infrared spectrum KBr disc device fisher-100 all the packages that have been recorded include totals for different (OH, C = O, CH, C = C), which represent aggregates of effective compounds isolated from flavonoids extracted from sugar and cinnamon, which is the key for subsequent studies and these values are consistent with the study in this area (19) as the studies in this area are few.

Note the emergence of packets that have been recorded for vehicles effective that have been isolated as follows example of flavonoids were at (3458, 2919, 1645, 1460, 1050)  $\text{Cm}^{-1}$  for beet, (3459, 2917, 1619, 1452, 1114  $\text{Cm}^{-1}$ ) of cinnamon,

respectively, where to pack a hydroxyl group (OH) appear when (3458,3459  $\text{Cm}^{-1}$ ) and the broadband The package phenomenon when (2919, 2917  $\text{Cm}^{-1}$ ) and be sharp and strong they are especially CH to the benzene ring the package when) 16459.161 (It brings to the carbonyl group The Package (1452 and 1114) and (1460 and 1050), they represent a C-O-C Special flavonoids.

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