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OPTIMIZATION OF EXTRACTION AND DEGRADATION PIGMENT FOR PINK BRACTS OF BOUGAINVILLEA GLABRA

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Abstract

Natural dyes and pigments have recently gained popularity in the food and textile industries due to their non-toxic and environmentally friendly properties. Increased reports of synthetic colorant health hazards and toxicity are driving the food industry to use natural colorants in an increasing number of processed food products. In this study, a visible spectrophotometer technique (390-600) was used to optimize the natural pigment extraction from Bougainvillea glabra flowers by varying four levels (solid/liquid ratio, solvent, PH, and time). Natural dyes were extracted from Cordyline fruticosa2 using nine solvents: n-butyl alcohol, ethyl-acetate, chloroform, methanol, ethanol, acetonitrile, n-hexane, and ethyl-ether and petroleum ether. The powdered plant material (500 g) was macerated for 72 hours at 25 1C in 50% ethanol. The extract was collected at room temperature, filtered, and dried in a rotary evaporator under reduced pressure, the yield percentage was discovered to be 2.7.

Keywords: betalains, Bougainvillea, pink bracts, extraction, spectrophotometer

INTRODUCTION

A pigment is a substance that alters the color of reflected or transmitted light through wavelength-selective absorption. In this physical process, most materials selectively absorb specific wavelengths of light, as opposed to phosphorescence, fluorescence and other types of luminescence in which a substance emits light.

The Natural Pigment composition of bougainvillea glabar (Nyctaginaceae) purple bracts is a highly complicated mixture of betacyanins, with a variety of acyl-ologoglycoside units substituting for the betacyanin [1] .Bathochromic and hypochromic shifts can occur after complexation. Chelating agents like EDTA and citric acid have been shown to preserve betanin from metal-catalyzed breakdown [2]–[6].The main issue that prevents betalains from being used as food colorants is their thermal deterioration at temperatures above 50 °C. The heat degradation of betacyanins (mostly re beet betanin) has been extensively investigated[5]–[10]. Only a few studies have focused on betaxanthins, while betacyanins have received the majority of attention (mostly betanin from red beet). In contrast to anthocyanins, betacyanins' color is unaffected by pH levels ranging from three to seven[6], [11], [12] .

To extract lutein, marigold flowers (Tagetes erecta) were sown. Finland's Rymättylä the red beetroot (beta vulgaris) used to extract the bteanin was bought from a grocery store. Red beets

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were utilised to extract betanin using water. Whole beets were diced into 1 cm3 cubes and extracted using magnetic stirring and aluminium foil shielding for 30 minutes at 70°C. After extraction, the solid plant matter was removed using a vacuum filter, and an evaporator was used to concentrate the extract to 60% of its initial volume. The pure extract was stored frozen at -20 °C before to usage in study [13]. Buffer-solutions were prepared with the following solvents: ((A) (0.20M) KCl , (B) (0.20M) HCl ,(C) (0.010M) $KHC_8O_4H_4$, (D) (0.10M) HCl , (E) (0.10M) NaOH , (F) (0.10M) KH_2PO_4 , (G) (0.0250M) borax , and (H) (0.050M) Na_2HPO_4 , A pH-meter was used to determine the exact pH values. During storage, pH values of the varied samples did not change [14].

Extraction time was altered at three levels: 1,2,4 h, temperature was varied at 40, 50, and 60 °C, pH was modified at 1.0, 1.50, and 2.0, and solid/liquid ratio was varied at 1/8, 1/10, and 1/12. The extract's absorbance was measured using a UV/Vis spectrophotometer (Ultrospec 4000, England) set to 516 nm and distilled water as the blank [15].

Since then, only G. globosa (Amaranthaceae)[16][17] and Bougainvillea (Nyctaginaceae) have been found to contain betacyanins with C-6 substitution[18]. Betanidin 6-O sophoroside derivatives (6-O-hydroxycinnamoyl). The violet-red pigments (bougainvillein- v's) extracted from Bougainvillea glabra var.sanderiana bracts have been linked to the acylated betacyanins. The entire betacyanin fraction was alkaline hydrolyzed, yielding four deacylated colors. The stability of betalain pigments, like that of other natural pigments, is influenced by a variety of factors such as light, oxygen, pH, water activity and temperature [9].

These pigments must be extracted and broken down in order to be used in a variety of products, including food, cosmetics, and medications. Therefore, the optimization of these processes is of great importance. This literature review summarizes the current state of knowledge on the optimization of pigment extraction and degradation for pink bracts of Bougainvillea glabra. [19] Optimized the extraction of anthocyanins from purple bracts using response surface methodology. They found that the optimal conditions for extraction were a solvent-to-solid ratio of 30:1, an extraction time of 6 h, and a temperature of 40°C. Similarly, [20]

EXPERIMENTAL

1. Chemicals

Scharlau provided acetone, ethanol, chloroform, 2-butanol, methanol, 2-propanol, diethyl ether and ethyl acetate Analytical grade formic acid, acetic acid, and sodium carbonate

2. Extraction of natural dyes

During the summer of 2018, the plant's bract (aerial part, flowers) was collected and identified at the college of agriculture, University of Duhok. A voucher specimen (3635) has been deposited at the Herbarium of the Duhok Province University (DPUH). According to the instructions provided (Figueroa et al. 2014), the pink pigment extracts from Bougainvillea glabra were extracted. Briefly, the flowers were washed with water and allowed to air dry. A coffee grinder was used to reduce the dried bracts to a fine powder before being stored in a

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cool, dark spot until the extraction was performed. A series of powdered plant materials weighing (0.666, 0.1, 0.133, 0.2, 0.266, 0.4, 0.5, 0.6, 0.7, and 0.8 gm) were macerated with 50% ethanol (1 ethanol: 1 water) for 72 hours at 20 C^0 to assess the cytotoxicity of Bougainvillaea x buttiana and determine their antioxidant activity.

RESULTS

In this research use the λ 525 for all the solvents that are in this table

group	Abb	Solvent	λ max	PH
G3	W	water	525	
	Et 1/3	1.0 Ethanol : 3.0 water	400	
	Et 3/1	3.0 Ethanol : 1.0 Water	400	
	Eta	ethanol absolute	400	
G4	w0.1	water :0.10 formic acid	400	3.50
	w1	99.0formic acid water:1.0	400	03
	w5	95.0 water: 5.0 formic acid	400	2.650
	E0.1	100.0 ethanol :99.90 water :0.10 formic acid	400	3.80
	E1	100.0 ethanol :99.0 water :1.0 formic acid	400	3.60
	E5	100.0 ethanol :95.0 water :5.0 formic acid	400	3.20
	f5	34.0 ethanol :68.0 water :5.0 formic acid		2.650
G5	w 0.01	0.010M Na2CO3		11.160
	w 0.1	0.10 M Na2CO3		11.350
	w 0.5	0.50 M Na2CO3		11.250
	E0.1	1.0 ethanol :1.0 (0.01 M Na2CO3)		9.30
	E1	1.0 ethanol :1.0 (0.1 M Na2CO3)		11.250
	E5	1.0 ethanol :1.0 (0.5 M Na2CO3)		11.30
G6	2-but	2.0- Butanol	300	3.20
	Dee	diethyl ether	304	3.20
	2-P	2.0- Propanol	411	3.20
	Ea	ethyl acetate	312	3.20
	Ac	Acetone	332	3.20
	Cl	Chloroform	300	3.20
G7	A5	95.0 water : 5.0 acetic acid		2.50
	A10	100.0 ethanol :95.0 water : 5.0 acetic acid		2.30
	E5	90.0 water :10.0 acetic acid		3.020
	E10	100.0 ethanol :90.0 water : 10.0 acetic acid		2.30
G8	m1/3	1.0methanol: 3.0water		
	m1/1	1.0methanol: 1.0water		
	m3/1	3.0methanol: 1.0water		

Figure 1, 2 Data: According to the results of the mass-to-solvent ratio, absorption rises as the weight of the bracts rises within a certain volume (20 ml). The absorbance varies from (0.660) gm to (0.10) gm (0.140 to 0.5270), while the weight is between (0.660) gm and (0.10) gm. The weight (0.80 grammes) has the maximum absorbance (2.3060) on day 1.

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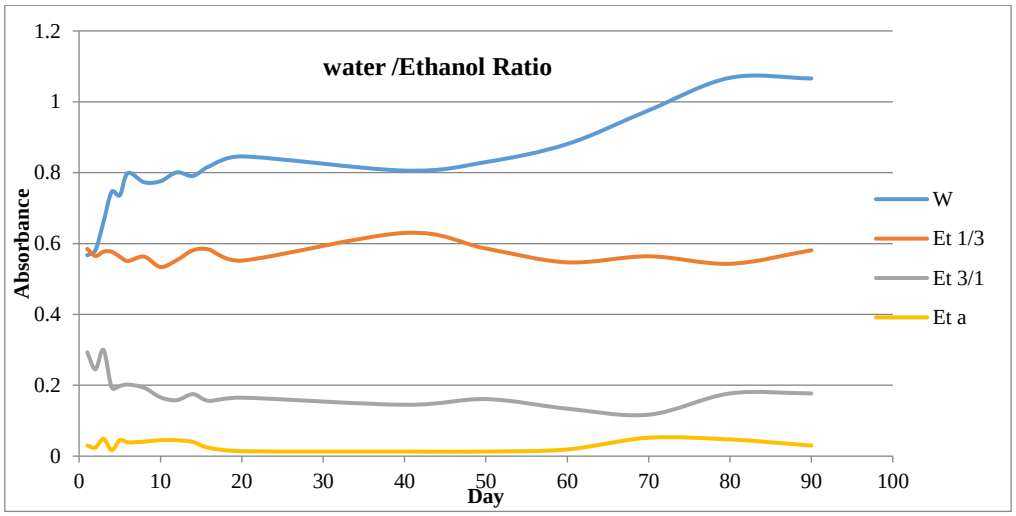

Figure 3:_The ratio of water to ethanol as a solvent is shown in (fig 3 data). The maximal absorbance in water solvent was (1.068) only on day 80; the water began extracting more pigment on day 6 and increased thereafter.

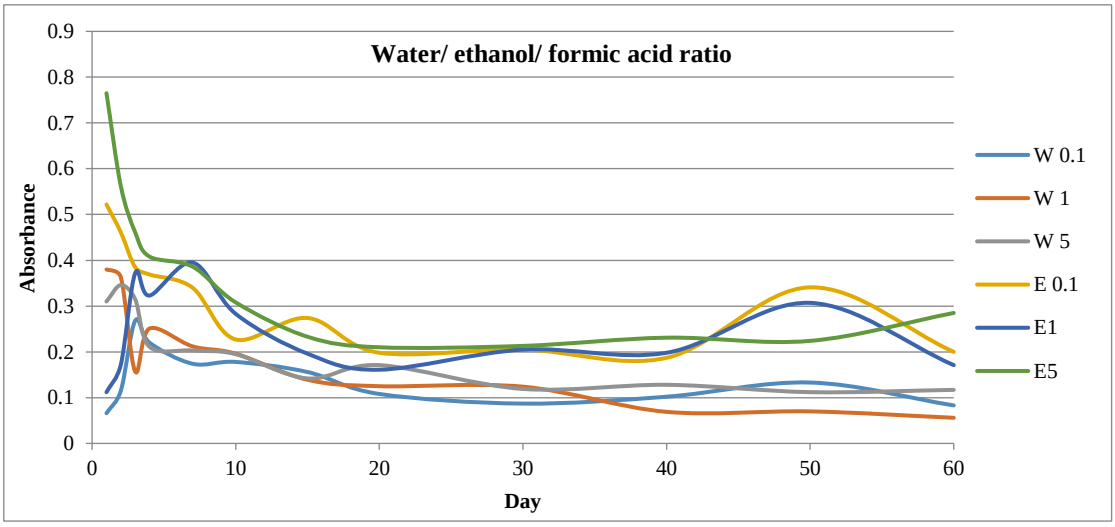

Figure 4: _The effect of Formic acid, ethanol and water ratios on pigment Extraction and stability is shown in (fig 4 data). The ratio (100 ethanol, 95 water, 5 formic acid) was the optimum solvent for extraction, giving the highest absorbance (0.765) on day 1. A mixture of three solvents (one of which contains formic acid) is preferable than a solvent without acid.

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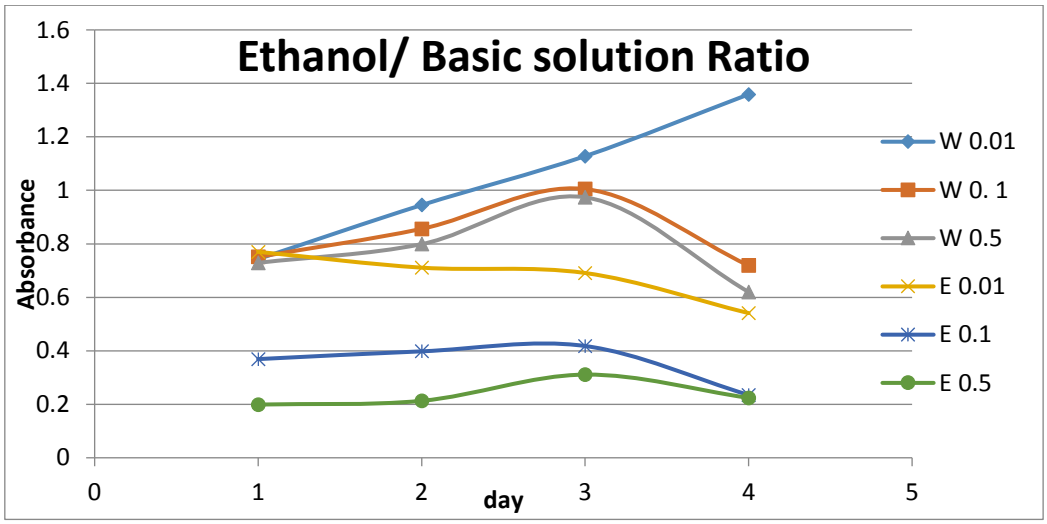

Figure 5:_The conversion of pink color to brawn direct by adding sodium carbonate (Base) is shown in (fig 5 data), with the maximum absorbance for brawn color being 1.359 in 4 days. In the real world, a higher basic concentration with ethanol equals more pigment breakdown and a more stable hue.

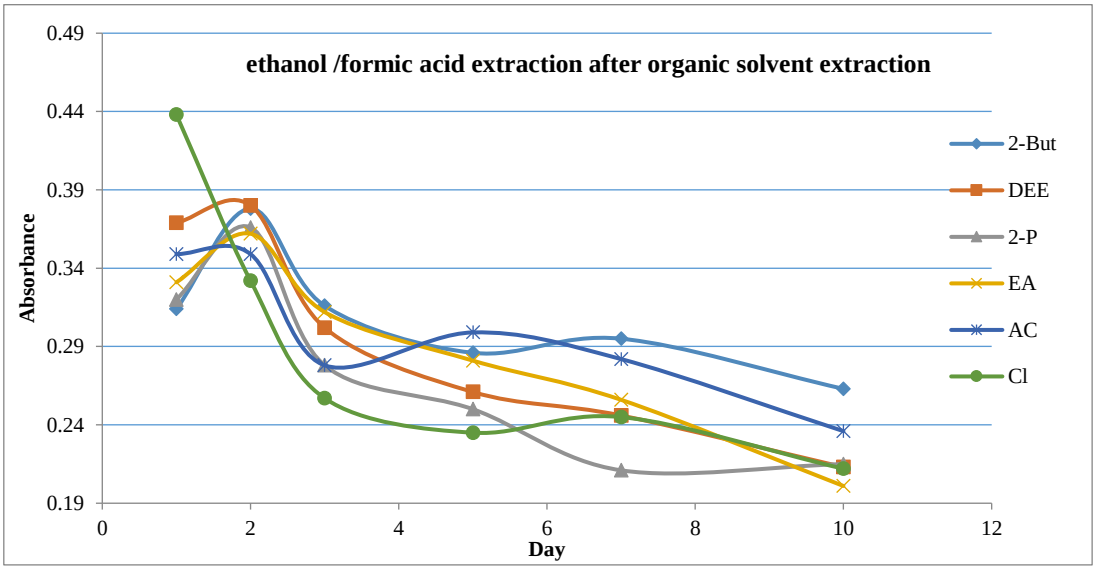

Figure 6:_The effect of a 1:3 (ethanol: water) solvent ratio after utilizing organic solvent is shown in (fig 6 data). Chloroform is the best organic solvent to utilize before extraction, while ethyl acetate is the least effective. Day 1 had the highest absorption (0.438).

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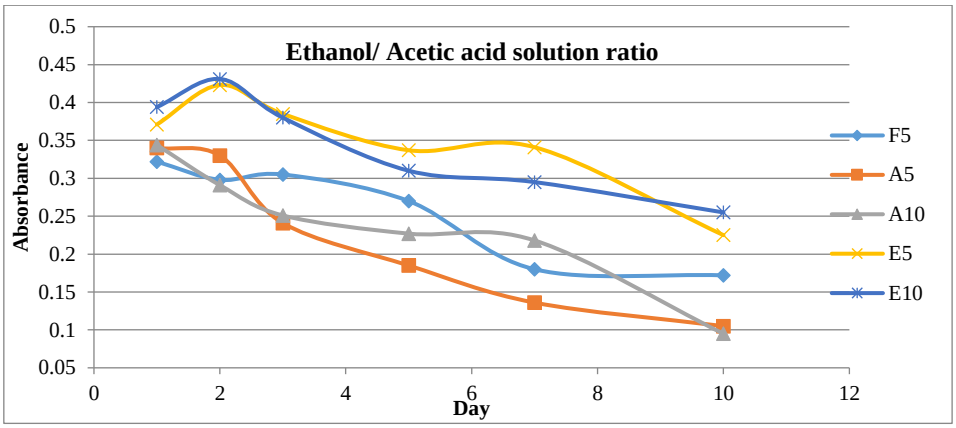

Figure 7 shows the impact of acetic acid in water alone and in water with ethanol. In general, ethanol-water extracts with acetic acid perform better than water alone. The proportion of 100 ethanol to 90 water is as follows: The best solvent for pigment extraction is acetic acid, with just a little difference between it and the other two solvents (0100 ethanol, 095 water, and 05 acetic acid).

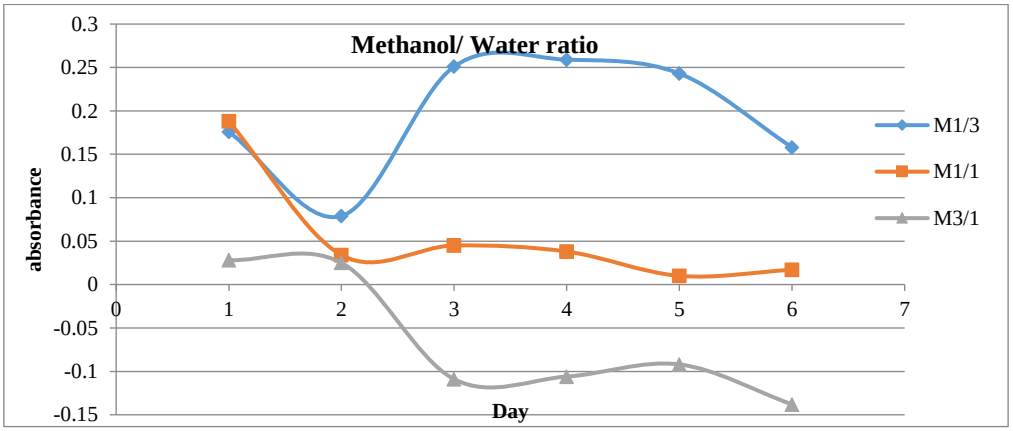

Figure 8:_The effect of the water/Methanol solvent ratio is shown in (Fig 8 data). In comparison to the other two ratios, 1Methanol:3Water is the best solvent for extracting pigment. On day 4, the methanol to water ratio was 1:3 and the maximum absorbance was 0.259.

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