

# Pigment Extraction from Flower Using Microwave Assisted Extraction

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**Abstract:** -- Extraction of pigment from flower with microwave assisted extraction (MAE) technic was investigated in this research in order to obtain an optimal condition under parameters varied. Rosa-damascena was studied as red color pigment source with applying ascorbic acid solution as solvent. For experiment, anthocyanin from Rosa-damascena was extracted under various parameter conditions which are inclusive of temperature (30° C to 80 ° C), solvent : solid ratio (10:1 to 30:1), time (5 min to 25 min), energy added (300 W to 1200 W). Then, UV-Visible spectrophotometer has been used for anthocyanin concentration determination. Color appearance has been proved by colorimeter, showing CIE L a\* b\* h° values.

**Index Terms:** - Anthocyanin, Microwave Assisted Extraction, Pigment, Rosa-damascena

## I. INTRODUCTION

Natural pigments are interesting as they are environmentally friendly as well as provision of safe feeling to consumer. A number of colorful flowers and fruits has been studied to enhance their pigment extraction and utilization e.g. extraction of red pigment from a hybrid rose [1], water-in-oil emulsion of anthocyanins from acai berry, roselle and red cabbage [2, 3], pigment extraction from paprika powder [4], extraction of anthocyanin from black current marc [5]. Less number of flowers in Thailand and technics applied in order to gain those pigments from flowers, however, have been investigated. With advantages of microwave assisted technic for instance using less amount of solvent, reducing operating time and availability for commercial scale, it became alternative way in which has been selected to study for this research as well. Anthocyanins are polar molecule and water-soluble vacuola flavonoid pigments which are playing important roles for blue, red, orange or purple colors[6]. In this study, red color anthocyanin solution from Rosa-damascena has been generated for further commercial scale implementation. Anthocyanins are prone to be degraded under aqueous solution and basic condition[7]. Also, anthocyanin degradation could be protected by ascorbic acid[8]. Consequently, ascorbic acid solution become solvent for this extraction. Thus, this research aims to extract pigments from Rosa-damascena which are available in Thailand to provision red color shade by applying microwave assisted extraction technic under parameters varied to obtain an optimal condition.

## II. MATERIAL AND METHOD

### Plant material

Fresh Rosa-damascena was purchased from flower market in Bangkok, Thailand. Sepals were cut, remaining only red parts. Rosa-damascena pedals were dried under shade for 24 hrs, before dewatering by hot air oven at 45 °C for 12 hrs. Dried Rosa-damascena pedals were milled by grinder (Phillips-HR2115) and screened by 20 mesh sieve orderly.

### Pigment extraction

Microwave Extractor (CEM, Mar 5) was facilitated and ascorbic acid solution was applied as solvent. Rosa-damascena pedal powder was raw material for this step. Pigment extraction have been conducted under parameter varied conditions as follows; temperature, solvent : solid ratio, holding time and microwave energy added. After operation, extracted solution was separated by vacuum filter. Supernatant was analyzed in next step.

### Pigment and color analysis

Pigment extracted solution has been tested in term of concentration and color appearance. Anthocyanin concentration was carried out by UV-Visible spectroscopy (UV-2450, Shimadzu). Colorimeter (UltraScan VIS, HunterLab) was equipped to record color shade according to CIELAB color coordination [9].

### Amount of anthocyanins calculation

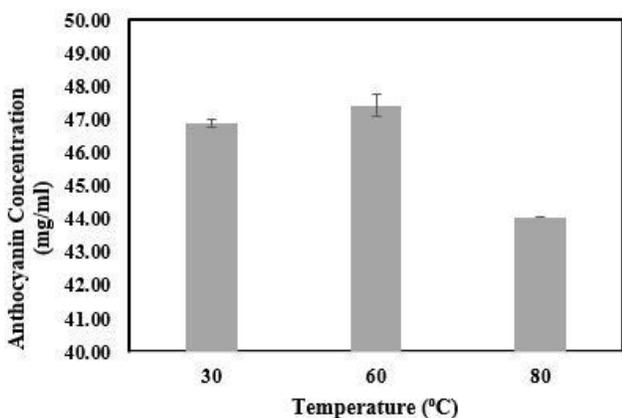
With anthocyanin's characteristic to transform its structure as well as having specific absorbance at different pH values, pH differential method was used to calculate the amount of anthocyanins. [10]

**Statistical analysis**

The repeatability relative standard deviation (RSD) has been applied.

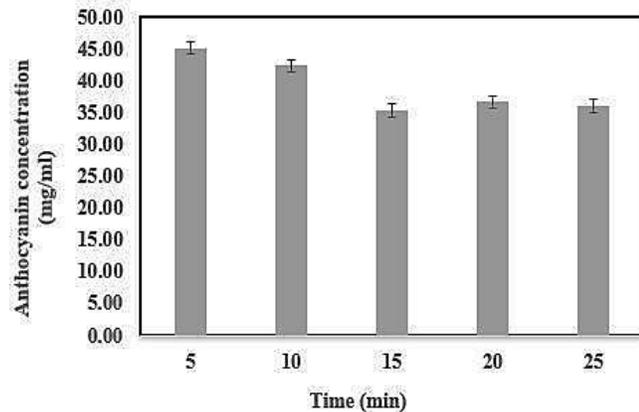
**III. RESULT AND DISCUSSION**

Results from experiment reveal effects of parameters varied on red anthocyanin pigments recovery efficiency. To begin with temperature, fig. 1, the highest anthocyanin yield was approximately 47 mg/ml at 60° C, whilst 69.7°C was detected for another raw material [5]. At higher temperature at 80° C, the anthocyanin extraction efficiency decreased because the anthocyanin compounds were disintegrated.



**Fig. 1 Effect of temperature on anthocyanins extraction efficiency.**

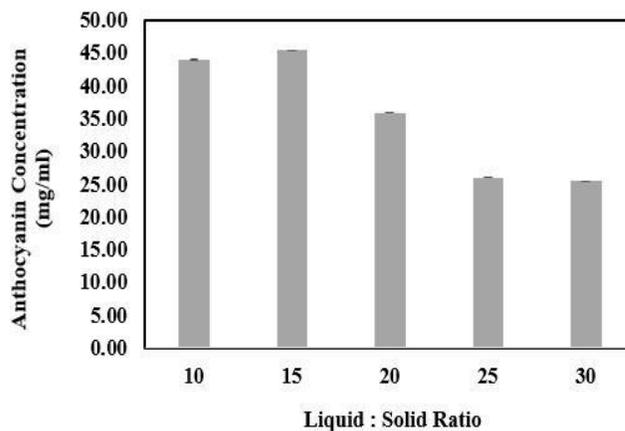
Holding time after microwave extractor reached setting temperature also affected to anthocyanin quantity as there might be limitation of anthocyanins' compound resistance against the energy added time. Fig. 2, at 5 min, the result showed highest value of around 45 mg/ml. Whilst, at more than 15 min the values were lower and stable.



**Fig. 2 Effect of holding time on anthocyanins extraction**

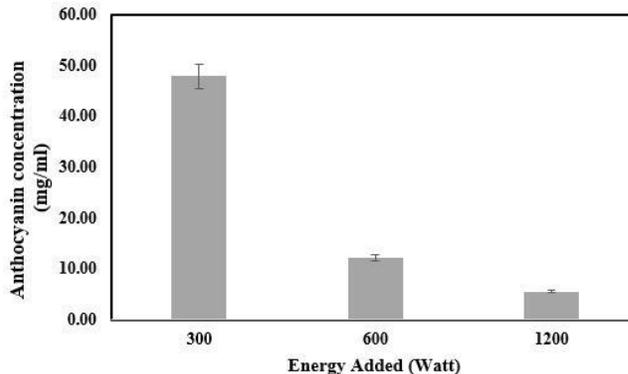
**efficiency.**

Clearly, there was impact of the solvent volumes and flower powder ratio. Fig. 3 demonstrates that 15 time of ascorbic acid solution resulted in the best extraction efficiency, obtaining approximately 45 mg/ml of anthocyanins. To compare with anthocyanin extracted from black current marc with hydrochloric acids, the solid: solvent was used 1: 20[5].



**Fig. 3 Effect of amount of solvent and flower powder ratio on anthocyanins extraction efficiency.**

As anthocyanin is an organic compound, high energy added could affect it. Thus, when power was adjusted depending on vessel numbers, it could be seen that the more energy was added, the less amount of product was recovered as shown in Fig 4. Around 47 mg/ml have been obtained at 300 W, whereas 700 W has been reported to gain anthocyanins from black currant marc [5].



**Fig. 4 Effect of energy power from microwave extractor on anthocyanins extraction efficiency.**

With regards to pigment solution color appearance, the value in table 1 showed that at hue angle of 16.77, a\* value was positive at 5.38. This could be proved that the color was

**International Journal of Science, Engineering and Management (IJSEM)**  
**Vol 3, Issue 5, May 2018**

red. pH value of before and after extraction process was identical at 3. Thus, there was no effect of microwave extractor on pH of system during operation.

Table. 1 Pigment solution product extracted under the optimal condition at solvent : solid ratio 15:1, 5 min, 60 ° C, and energy added 300 W measured color appearance by colorimeter

**CIELAB Results**

L*	a*	b*	C*	h°
25.38	5.38	1.62	5.62	16.77

In addition, Fig.5 shows flower pedals picture before extraction process, pedal powder after milling and red pigment solution product.



**Fig. 5 Dried Rosa-damascena, pedal powder after milling and red pigment color solution.**

**IV. CONCLUSION**

It has been found that pigment extracted solution from Rosa-damascena showed red color according to positive a\* with value of 5.38 and hue angle (h°) of 16.77 which is under red color angle. The optimal conditions were at 15:1 solvent : solid ratio, at time of 5 min, temperature of 60 ° C, and energy added of 300 W.

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