

## UTILIZATION OF BINAHONG (*ANREDERA CORDIFOLIA* (TEN.) STEENIS) LEAVES EXTRACT AS HERBAL MEDICINE VIA ULTRASONICATION

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### Abstract

The leaves of *Anredera cordifolia*, or binahong, are one of the herbal plants with a high potential for antioxidants and have been reported to be rich in flavonoids. This study aimed to determine the best operating conditions in the ultrasonication extraction method from binahong leaves extract on the yield obtained. Experiments were conducted into how extraction conditions affected the ultrasonication extraction of binahong leaves. Different extraction parameters, such as ethanol concentration (20–100%), time (10–40 min), temperature (30–70 °C), and yield impacts, were used to extract powdered dried binahong leaves. The results showed all extraction parameters to have significant effects on yield obtained. The maximum yield of extract from binahong leaves was obtained at 60 ml of ethanol concentration, 20 minutes of extraction time, and 50°C ultrasonication bath temperature. Thus, it can be concluded that the ultrasonication process is a good way to obtain a better yield of *simplicia* of binahong leaves extract as a therapeutic herbal in the future.

**Keywords:** Antioxidant; binahong leaves; therapeutic; ultrasonication; *simplicia*

### Abstrak

Daun binahong, merupakan salah satu tanaman herbal yang memiliki potensi antioksidan yang tinggi dan dilaporkan kaya akan kandungan flavonoid. Penelitian ini bertujuan untuk mengetahui kondisi operasi terbaik dalam metode ekstraksi ultrasonikasi dari ekstrak daun binahong terhadap rendemen yang diperoleh. Eksperimen dilakukan untuk mengetahui kondisi ekstraksi mempengaruhi ekstraksi ultrasonikasi daun binahong. Parameter ekstraksi yang dianalisis, seperti konsentrasi etanol (20-100 ml), waktu (10-40 menit), temperatur (30-70 °C), serta pengaruhnya, digunakan untuk mengekstrak serbuk daun binahong kering. Hasil penelitian menunjukkan semua parameter ekstraksi berpengaruh signifikan terhadap rendemen yang diperoleh. Rendemen maksimum ekstrak dari daun binahong diperoleh pada konsentrasi etanol 60 ml, waktu ekstraksi 20 menit, dan temperatur ekstraksi 50°C. Dengan demikian, dapat disimpulkan bahwa proses ultrasonikasi adalah cara yang baik untuk mendapatkan hasil yang lebih baik dari *simplicia* ekstrak daun binahong sebagai herbal terapeutik di masa depan.

**Kata Kunci:** Antioksidan; daun binahong; terapeutik; ultrasonikasi; *simplicia*

## 1. Introduction

Medicinal herbs have been suggested as a potentially effective treatment option in the future. Since ages ago, medicinal plants have been used for many purposes and are highly valued globally for their abundant supply of therapeutic substances that can be used to prevent illnesses and ailments [1], [2]. Therapy with natural ingredients is increasing because of the mindset of back to nature and natural medicine has much lower side effects compared to conventional drugs, no resistance, easy to obtain and safe [3], [4]. Besides, the way to consume drugs from natural ingredients is by boiling, taking the juice by squeezing, as well as directly consumed.

Phytochemical compounds found in medicinal herbs are thought to be abundant and essential for the creation of novel medications. In Indonesia, out of 30 thousand and 950 types of plants used for treatment is binahong leaves plant (*Anredera cordifolia* (Ten.) Steenis) with a high potential for antioxidants [5]. Binahong leaves have been shown in earlier studies to possess pharmacological properties that include antibacterial, antihyperlipidemic, and antihyperglycemic effects [6].

A key factor in the utilisation of plant active components are the solvent type and extraction technique. Himawan et al. reported that a 70% ethanol extract can yield the bioactive compounds found in binahong leaves. Dwitiyanti et al. concluded that binahong leaves have a 96% ethanolic extract that contains bioactive compounds with pharmacognostic parameters that were determined by using the Indonesian Herbal Pharmacopeia's criteria [7]. Bioactive compound molecules can be dissolved by ethanol solvent, a polar solvent [8].

Many different types of bioactive compounds have been highly extracted using conventional extraction i.e. maceration and percolation. However, significant solvent volumes and extended extraction durations are needed. One of the most efficient and suited extraction techniques for obtaining bioactive chemicals from binahong leaves is ultrasonication. A study by Utami et al. reported that ultrasound extraction from binahong leaves have significant effect to bioactive compound with temperature of 45°C for 20 minutes obtained the highest yield of 10.44% [9]. Bioactive components from binahong leaves can be extracted via ultrasonication in a relatively short amount of time, at a low temperature, with less energy and solvent needed.

There are several factors that influence the amount of yield produced in the ultrasonication method, including solvent concentration, operating time and temperature [10]–[12]. The yield rises with an initial increase in sonication time and falls with subsequent increases in time, the effect is comparable to an increase in temperature. Al-Dhabi et al. noticed this tendency in the extraction of phenolic component from discarded spent coffee grounds using an ultrasound method, where the yield increased as the temperature rose from 30 °C to 45 °C and declined above 45 °C [13]. Therefore, this study focuses on the yield of binahong leaves extract obtained from the ultrasonication method with the parameters of solvent concentration, operating time and temperature.

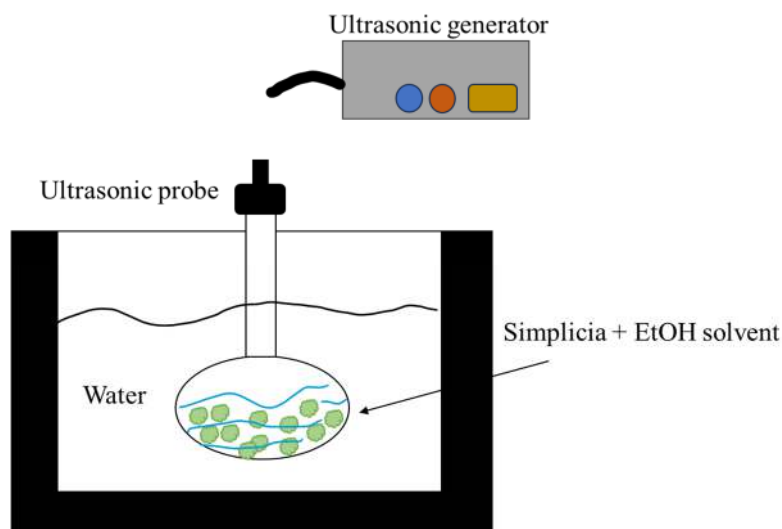
## 2. Research Method

### Raw material:

Fresh binahong leaves were collected from local nursery in Surabaya, East Java. Binahong leaves were washed and dried in an oven for 24 hours at 105°C, then grinded and sieved to a particle size of 100 mesh. Binahong leaves extract preparation was described in previous study [5]. Ethanol 96% (Sigma Aldrich) was used as solvent.

### Extraction procedure:

The ultrasonic extraction was carried out on an ultrasound bath at a frequency of 45 kHz and power of 450 W as shown in Figure 1.

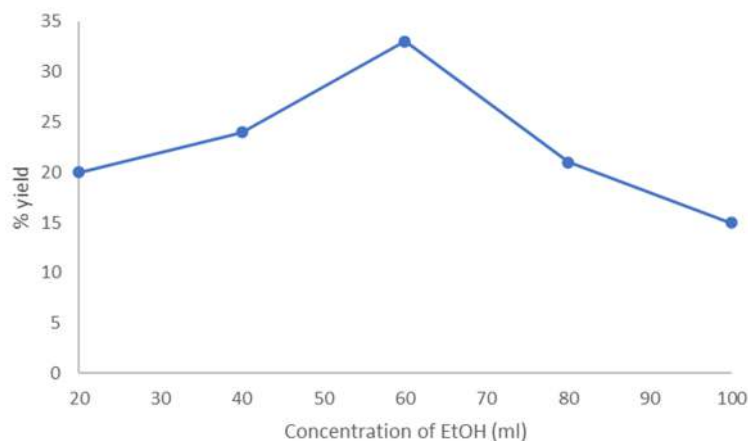


**Figure 1. Ultrasonication extraction scheme**

Binahong leaves powder in varying mass of 0.25, 0.5, 0.75 and 1 g were added into flasks. Ultrasonic extraction was employed by varying parameters such as ethanol concentration, temperature and time during extraction. Ultrasound extraction varying to the ethanol concentration of (20, 40, 60, 80 100) ml, time durations of (5, 10, 15, 20) minutes, temperature of (30, 40, 50, 70) °C. The extracted samples were filtered, and the solvent was then eliminated by placing the filtrate in a hot water bath heated to between 70 and 90 degrees Celsius. After all the aforementioned factors that produced the highest yield were filtered using a vacuum filtration pump, the yield's quantity was determined.

## 3. Results and Discussion

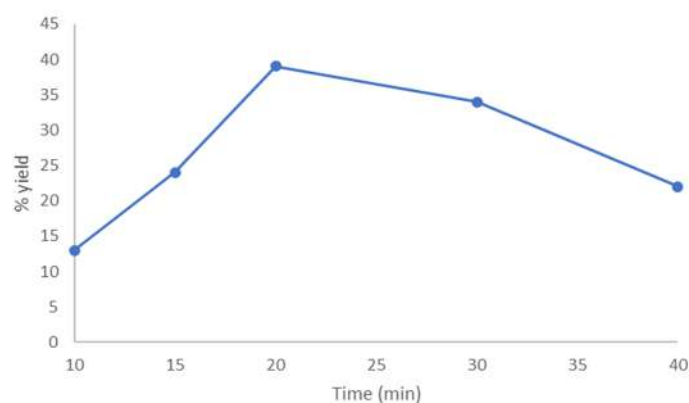
Fig. 2. displays the extraction yield of binahong leaves using the ultrasonic extraction method with various ethanol concentrations in distilled water. The solvent ethanol was chosen because ethanol is a solvent that is semi-polar in its use, meaning that the solvent can distill or extract compounds that are both polar and semipolar in nature. Ethanol is a solvent that can extract flavonoid compounds, saponins, tannins, terpenoids, and alkaloids [9]. When the ethanol concentration rises from 20 to 60 ml, the extraction yield first increases and then decreases when it reaches 80 ml. Consequently, the optimum ethanol concentration is 60 ml since this is the value at which the highest extraction yield 33% achieved.



**Figure 2. Effect of EtOH concentration on the yield**

Solvents with high polarity have the ability to extract a group of compounds with a wider polarity. The higher water content of ethanol affected the polarity concentrations of the ethanol solvent utilised in this investigation. In comparison to pure ethanol, its polarity increases with the amount of water it contains. This led to higher extraction yields by enabling non-phenolic polar components to dissolve during the extraction process [14].

Figure 3 demonstrates the extraction yield obtained using ultrasonication technique at varying time intervals of 10 to 40 minutes. When the duration of ultrasonication exceeds 30 minutes, the rise decreases. It indicates that the interaction ability of the solvent with the target compound has reached its limitation [11]. Therefore, a 20 minutes duration was ideal for obtaining a higher yield 37% in the extraction of binahong leaves using ultrasonication.

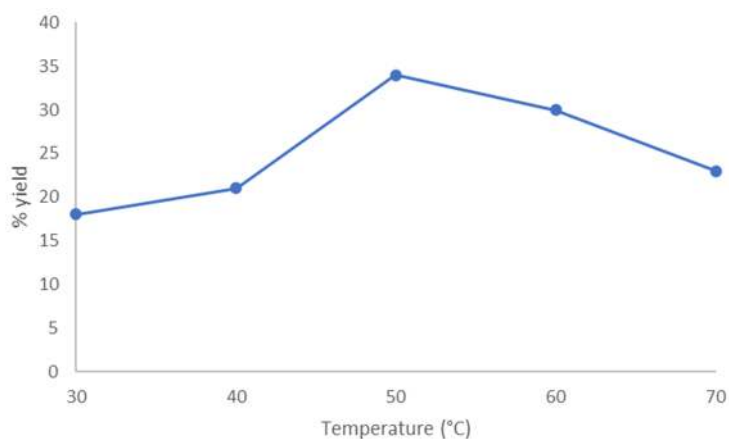


**Figure 3. Effect of extraction time on the yield**

Oroian et al. examined the impact of ethanol concentration, time and temperature on the propolis extraction using UAE method. In terms of the extraction duration, it found that 30 minutes of UAE method was necessary for ideal results [15]. Regarding energy-saving and process efficiency rating, extraction time is an important part. The extraction yield of binahong leaves using ultrasound extraction method with temperature ranging 30 to 70 °C was shown in Fig. 4. At 50 °C gave the higher percentage of yield 36% C, however

the yield decreases slightly at temperature 60 ° and so on. The increase in temperature will make water molecules as solvents move faster randomly so that they are more easily distributed into the binahong extract matrix. As a result, depending on the extraction temperature, phenolic compounds can be extracted with high selectivity.

Cheznovoka et al. performed an ultrasound-assisted extraction at 25 to 65 °C and analysed anthocyanins extract from berry. Anthocyanin pigment yield is increased by 22% using ultrasound-assisted extraction when the temperature is maintained at 25°C for 30 minutes. The extraction period is shortened to 15 minutes by raising the temperature during ultrasonic-assisted extraction to 65°C [16].



**Figure 4. Effect of temperature during extraction on the yield**

The polarity of water was reduced at higher temperatures, allowing it to solvate the nonpolar compounds and extract them. Higher temperatures increased the possibility of substance degradation, which is why it was seen that extracting substance decreased. It can be concluded that the higher the extraction temperature, the greater the yield obtained.

#### 4. Conclusion

The ultrasonication method has been successfully utilized to extract binahong leaves as herbal medicine based on operating conditions including the parameters of ethanol solvent concentration, operating time and temperature. The optimum ethanol concentration is 60 ml since this is the value at which the highest extraction yield 33% achieved. Time (10–40 min), temperature (30–70 °C), and yield impacts, were used to extract powdered dried binahong leaves. The results showed all extraction parameters to have significant effects on yield obtained. The maximum yield of extract from binahong leaves was obtained at 60 ml of ethanol concentration. A 20 minutes duration was ideal for obtaining a higher yield 37% in the extraction of binahong leaves using ultrasonication and 50°C ultrasonication bath temperature. Thus, it suggested that the ultrasonication process is a good way to obtain a better yield of simplicia of binahong leaves extract as a therapeutic herbal in the future.

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