

## Identification of Flavonoid Content of Noni Fruit Alcohol Extraction (*Morinda citrifolia* L) Using Microwave Assisted Extraction (MAE) Method as a Pilot Study of Herbs

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### Abstract

Flavonoids are phenolic compounds most commonly found in many plants, including noni fruit. Noni fruit also has many benefits for the pharmaceutical and herbal industries. Microwave-assisted extraction (MAE) is an effective and rapid method for obtaining bioactive compounds from plant materials. This research is a laboratory experimental study using noni-fruit samples and contributions to identify flavonoid compounds in noni-fruit extract. Noni fruit was dried before being processed into a simple powder. Using 96% ethanol and 70% alcohol solvents, the MAE method concentrated the extract for two minutes at 50 C. Using HCL solvent, the noni extract was then identified as having flavonoids. The results showed that flavonoid compounds were present in a 70% alcohol extract of noni fruit.

**Keywords:** Flavonoids; Ethanol extraction; Noni fruit (*Morinda citrifolia* L); Microwave Assisted Extraction (MEA); Herbs

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### 1. Introduction

The Noni fruit, called *Morinda citrifolia* L., has long been utilized in traditional herbal medicine to address various health issues, including hypertension, diabetes, and inflammation (Handayani et al., 2022). The fruit has been acknowledged for enhancing blood circulation and controlling hypertension, dyslipidemia, and diabetes (Almeida et al., 2019). In addition, noni fruit has demonstrated antibacterial, antioxidant, and antiproliferative properties, which make it a strong contender for the creation of phytopharmaceuticals (Perdana et al., 2022; Gopal et al., 2022; Noviana et al., 2021). The noni fruit has been discovered to possess many natural polysaccharides, which could potentially contribute to its health-promoting properties (Cai et al., 2023). The bioactive chemicals found in the fruit, such as scopoletin and xeronin, have been linked to their ability to lower blood pressure and function as antioxidants. This highlights the need to discover and measure these components in noni fruit extract (Hijriansyah et al., 2020; Wang et al., 2021).

Noni fruit has been shown to have therapeutic effects on several health disorders, such

as osteoarthritis, gouty arthritis, and antibacterial activity against pathogenic bacteria. These effects are attributed to its phytochemical makeup (Osman et al., 2019; Li et al., 2021; Mauliku, 2021). These findings emphasize the importance of investigating the flavonoid composition of noni fruit extract. Flavonoids are recognized for their potential anti-inflammatory, antioxidant, and antimicrobial properties, which correspond to the observed health advantages of noni fruit (Meilawati et al., 2021; Gopal et al., 2022; Noviana et al., 2021).

Accurate determination of the flavonoid concentration in noni fruit extract is crucial for developing standardized herbal products with consistent phytopharmaceutical profiles. Standardizing noni fruit extract can simplify its incorporation into traditional medicine and pharmaceutical formulations, guaranteeing consistent bioactivity and safety (Dewi et al., 2022; Prasad et al., 2019).

The Microwave Assisted Extraction (MAE) technique is an innovative method of extracting bioactive chemicals from natural substances. Although earlier studies have investigated the phytochemical composition and biological effects

of noni fruit, there is a dearth of studies on suitable extraction techniques, precisely the MAE method, for determining flavonoid levels (Meilawati et al., 2021). The lack of knowledge in this area emphasizes the necessity for additional research on the effects of the MAE method on the content of phytopharmaceuticals and the identification of flavonoids through solvents during the extraction process. This study contributes to identifying the flavonoid content of noni fruit extract using the microwave-assisted extraction (MAE) method.

## 2. Method

This type of research is a laboratory *experiment* to detect the content of active substances such as flavonoids. Ripe noni fruit is picked directly from the noni tree and brought to the Biomedical Laboratory of Universitas Respati Yogyakarta to be dried into *simplicia* and extracted. The tools used in this study are analytical balances, knives, cutting boards, spoons, label paper, sample containers, filter paper, microwaves (Trevizo) made in Italy, erlenmeyer, measuring cups, and funnels. The materials used are noni fruit, 96% ethanol, 75% alcohol, Mayer reagent, wilstater reagent, smith-metacalve reagent, and 1% FeCl<sub>3</sub> reagent.

Making *simplicia* starts from the wet sorting process, washing, knitting, drying with the help of an oven, dry sorting, and grinding into powder. After that, the *simplicia* powder is stored in a clean, dry, and tightly closed container. The extraction process is done by putting 100g of noni fruit *simplicia* powder into the bottle. Add 500 mL of ethanol solvent and alcohol to each bottle. The *marinade* results are then in the *microwave* for 2 minutes with a temperature of 50°C. Strain the noni extract bath with filter paper. Next, test the ingredients with reagents to identify flavonoid content. Identification The extract was weighed 0.5 g into a test tube and dissolved with 70% ethanol, then 0.5 g of magnesium powder and 5-6 drops of concentrated HCl were added (Hafiz et al., 2019). Positive extracts containing flavonoids are characterized by the formation of an orange color (Liu et al., 2020).

## 3. Result and Discussion

### *Microwave Assisted Extraction (MAE) method*

Noni extraction using microwave-assisted extraction (MAE) at a temperature of 50 degrees Celsius for 2 minutes decreased extract yield volume and made the extract thicker. These findings are consistent with previous studies exploring the physicochemical, antioxidant, and polysaccharide antiproliferative properties of *Morinda citrifolia L.* (Noni) based on different extraction methods (Li et al., 2020). This research provides valuable insights into the effects of other extraction methods on noni-extract properties,

supporting observed changes in extract yield and consistency with MAE use.

This study also revealed the effect of the microwave-assisted extraction (MAE) method on noni-leaf extract activity. The study is in line with current findings and supports the idea that extraction methods, especially MAE, can significantly affect the properties of noni extracts, including their phytochemical activity. This research highlights the use of MAE as a new technique for alternative extraction procedures, emphasizing its relevance in exploring the effects of extraction methods on noni-extract properties. This supports the importance of considering MAE as an essential factor in understanding changes in extract yield and consistency observed under different extraction conditions (Varijakzhan et al., 2021).

### Identification of flavonoid compounds

Based on the observation, extracts with 70% alcohol solvent resulted in positive outcomes, indicating the presence of flavonoids, as evidenced by a change in color to orange. Conversely, 96% ethanol solvent extraction led to negative results, characterized by a yellow color change. This observation aligns with the findings of (Dirar et al., 2019), who studied the effects of extraction solvents on the total phenolic and flavonoid contents of medicinal plant extracts. The study demonstrated that the choice of extraction solvent significantly impacted the extraction of flavonoids, thereby influencing the biological activities of the extracts. Furthermore, the presence of flavonoids in the extracts was also supported by the phytochemical analysis of extracts (Izundu et al., 2021), which revealed the presence of flavonoids in the plant extracts. Additionally, the study by Wulandari et al. (2021) emphasized the positive indication of flavonoids by a color change to red, yellow, or orange, further supporting the observed color change in the discussed extracts. The identification results can be seen in [Table 1](#).

**Table 1.** Phytochemical screening results of noni fruit with ethanol extract and alcohol.

Solvent	Flavonoid	Information
Ethanol 96%	-	Yellow
Alcohol 70%	+	Orange

Moreover, the study by Silpa et al. (2019) provided insights into the descending order of flavonoid content in plant extracts, with alcohol being one of the solvents with notable flavonoid content. This finding corroborates the positive outcome observed with the 70% alcohol solvent. Additionally, the presence of flavonoids in the extracts was further confirmed by chromatographic fingerprinting, as demonstrated in the study by

(Thakare et al., 2022). Meetong et al. (2023) also determined the total flavonoid content of extracts using the aluminum chloride colorimetric method, which supports the identification of flavonoids in the discussed extracts.

On the other hand, the negative outcome observed with the 96% ethanol solvent aligns with the findings of (Kontagora et al., 2021), where the absence of flavonoids in ethanol extracts was reported. This discrepancy in outcomes based on the choice of solvent was further supported by the study of (Sari et al., 2022), which highlighted the influence of solvent ratio on flavonoid extraction, potentially explaining the negative result with the 96% ethanol solvent.

Phytochemicals are naturally occurring compounds found in plants, and they have gained significant attention due to their potential health benefits. Flavonoids, a class of phytochemicals with multiple phenolic structures, are widely distributed in the plant kingdom and are found in various plant sources such as vegetables, fruits, grains, roots, herbs, and tea products (Tan et al., 2022). The identification and analysis of phytochemicals, including flavonoids, play a crucial role in understanding the pharmacological activities of plants (Shaikh & Patil, 2020). Studies have shown that phytochemical analysis of plant extracts often reveals the presence of flavonoids, phenols, tannins, and other bioactive compounds. These compounds are known for their antioxidant properties and have been associated with potential health benefits. Furthermore, the screening and quantitative analysis of phytochemicals in plant extracts are essential for understanding their biological activities and possible medicinal uses.

Identifying phytochemical constituents, including flavonoids, is crucial for understanding the medicinal properties of plants. These compounds, which are often referred to as "secondary metabolites," encompass a wide range of chemical compounds such as flavonoids, alkaloids, coumarins, tannins, phenols, phlorotannin, anthraquinones, terpenoids, cardiac glycosides, steroids, and phytosterols. Flavonoids and other phytochemicals in plant materials have been linked to their antioxidant potential and role in modulating lipid metabolism, affecting health and disease prevention. Additionally, the polarity-dependent response of phytochemical extraction has been studied, highlighting the importance of understanding the extraction methods for different phytochemicals, including flavonoids, from various plant parts.

#### 4. Conclusion

Alcohol extracts 70% of noni fruit contains flavonoid compounds. The findings from this study confirm the potential of noni fruit extract towards

health benefits, especially in terms of antioxidant, anti-inflammatory, immune-modulating, and possible anticancer effects.

#### 5. References

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