# Phytochemical Screening and Antioxidant Activity of Kabau Seed Pod Extract from South Lampung

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**Abstract.** The "Julang-jaling" or Kabau plant is a common vegetation found in Sumatra. Kabau seeds are used by local communities in Sumatra as a culinary ingredient and spice. Several studies have demonstrated that *Archidendron bubalinum*, a species of Kabau plant, contains phytochemical compounds including flavonoids, tannins, saponins, and steroids. However, the utilization of Kabau's seed pod remains limited and remains unexplored. This research aims to describe the morphological characteristics of the Kabau plant from South Lampung Regency, followed by analyzing the phytochemical compounds, and antioxidant activity of the Kabau seed pod extract. Qualitative phytochemical screening was conducted qualitatively to detect the presence of alkaloids, flavonoids, saponins, phenolics, tannins, steroids, and triterpenoids. Antioxidant activity was analyzed using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method. Identification of morphological characteristics presented that *Archidendron jiringoides* in this study had several differences compared to *Archidendron bubalinum*. i.e seed arrangement and diameter; seed pod length, diameter, shape, and colour; also twig shape. The result of qualitative phytochemical screening of kabau (*Archidendron jiringoides*) seed pod extract showed the presence of flavonoids, saponins, phenolics, tannins, and triterpenoids. The antioxidant activity ($IC_{50}$) value of 32.01 µg/ml. The antioxidant potential observed in the extract of kabau seed pods was categorized as very strong.

## 1 Introduction

The kabau plant, a member of the Fabaceae Family, thrives naturally within tropical rainforests [1]. Its nomenclature varies based on regional contexts; in Lampung Province, it is referred to as "julang-jaling." Within Sumatra, several kabau varieties are present, including *Archidendron bubalinum*, *Archidendron jiringoides* [2]. While less prominent than its closely related counterpart, the jengkol plant, the kabau plant stands out due to its smaller seed size and more pungent aroma. The kabau plant used within communities as a culinary

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ingredient known to enhance appetite [3]. Moreover, the active compounds in kabau seed extracts offer numerous benefits, spanning anti-inflammatory, antibacterial, antioxidant, anti-diarrheal, expectorant, and even cancer cell inhibition properties [4].

The *Archidendron bubalinum* is the most prevalent in daily life. Prior research has indicated that *Archidendron bubalinum* boasts antibacterial, antiviral, antiparasitic, and antioxidant capabilities [5]. Plant-based antioxidants encompass vitamins E and C, as well as carotenoids. Furthermore, phytochemical compounds, including alkaloids, saponins, phenols, flavonoids, tannins, and steroids, also contribute to the antioxidant activity [6]. These antioxidants function by donating electrons to free radicals, thus curbing oxidative stress. While the human body inherently manages free radical levels, excessive free radicals require additional compounds to counterbalance their impact [7].

Until now, only the kabau plant of *Archidendron bubalinum* has carried out a lot of research on its ingredients and its use in the field of pharmacology. Kabau from South Lampung has not been reported regarding its content and benefits. This research aims to describe the morphological characteristics of the Kabau plant from South Lampung Regency, followed by analyzing the phytochemical compounds, and antioxidant activity of the Kabau seed pod extract.

## 2 Materials and Methods

### 2.1 Sampling and Identification

Kabau seed pod sample was collected from South Lampung Regency. The specimen identification and description were carried out by observing the morphology of the plant, including seeds, seed pod, leaves, and twigs, and compare them with known kabau plants *Archidendron bubalinum* [2].

### 2.2 Seed Pod Extraction

A total of 2 kg kabau seed pod was washed, sun-dried for a week, and powdered. Then 1 kg of kabau seed pod powder was macerated using 6 L of 96% ethanol for 3 x 24 hours at room temperature with manually stirred several times. The solution was then filtered using filter paper and the filtrate was evaporated using a rotary evaporator.

### 2.3 Phytochemical Screening of Kabau Seed Pod Extract

#### *2.3.1 Flavonoid*

The flavonoid test was carried out with about 30 mg of the seed pod extract, then about 30 mg of Mg powder, and four drops of 2% HCl were added. A positive result is concluded if the filtrate color shifts from orange to red [8].

#### *2.3.2 Alkaloid*

The alkaloid test was carried out by adding the kabau seed pod extract to a test tube, followed by the introduction of a few drops of 2N HCl and distilled water. The mixture was then heated for a duration of 2 minutes. In the post-heating, the extract was cooled and subsequently filtered using filter paper. After filtration, add 2 drops of Mayer's solution and observe any

resulting changes. A positive result for the alkaloid test is determined by the formation of a yellow precipitate [8].

### *2.3.3 Saponin*

Conducting the saponin test involved blending 0.5 grams of kabau seed pod extract with 10 ml of hot water. The mixture was then cooled and shaken vigorously for 10 seconds until foam appeared. Following this, a single drop of 2N HCl was added, and the persistence of foam was noted after the addition of 2N HCl. The saponin test yields a positive outcome if the foam remains intact despite the introduction of 2N HCl [9].

### *2.3.4 Phenolic and Tannin*

The phenolic and tannin tests were carried out together due to the fact that tannin compounds are classified as polyphenolic. Therefore, the presence of phenolic compounds can signify the presence of tannin compounds as well. This assessment involved combining 5 grams of the sample with 10 ml of distilled water, filtering the mixture, and subsequently diluting the filtrate with distilled water until it became colorless. A total of 2 ml of the solution was combined with 1 to 2 drops of FeCl3 reagent. Positive results for the phenolic and tannin tests are characterized by a color change in the solution, transitioning to blue or green-black [9].

### *2.3.5 Steroids and Triterpenoids*

For the assessment of steroids and triterpenoids, the process entailed introducing kabau seed pod extract into a test tube, followed by the addition of 1 to 2 drops of glacial acetic acid solution and 1 to 2 drops of concentrated sulfuric acid solution (H2SO4). The steroid test produces a positive result when the solution changes color to blue or purple, while the triterpenoid test yields a positive result when the solution changes color to red or orange.

## 2.4 Measurement of antioxidant activity using DPPH (2,2-diphenyl-1-picrylhydrazyl)

A total of 10 mg of DPPH was dissolved in 100 mL of ethanol, followed by thorough homogenization. The resultant solution was stored within an opaque bottle to ensure preservation in a dark environment, resulting in a concentration of 100 ppm. Subsequently, a blank solution was prepared by combining 5 mL of the 100 ppm DPPH solution with 25 mL of an ethanol solution. Antioxidant activity was measured by dissolving 10 mg of kabau seed pod extract in 20 mL of ethanol, establishing a concentration of 500 ppm. Additionally, standard solutions were generated, featuring a range of concentrations: 10 ppm, 20 ppm, 30 ppm, 40 ppm, and 50 ppm. This was accomplished by transferring 1 ml, 2 ml, 3 ml, 4 ml, and 5 ml of the 100 ppm DPPH solution into separate containers, which were then supplemented with ethanol to attain a final volume of 10 ml. The mixtures were thoroughly homogenized and allowed to incubate for a duration of 30 minutes to ensure the completion of the reaction between the extract and DPPH. Subsequently, absorbance measurements were carried out using a UV-Vis spectrophotometer, with the wavelength set at 517 nm. This procedure facilitated the assessment of the extent of the reaction between the extract and DPPH, thereby providing insights into the antioxidant activity of the kabau seed pod extract.

# 3 Results and Discussion

## 3.1 Determination of Kabau

The plant's identity was determined through a comprehensive assessment of its various components, including seeds, seed pods, twigs, leaves, and flowers. The assessment was conducted objectively and with precision, ensuring accurate results. The kabau plant used in this study closely resembled the *Archidendron jiringoides*. A comparative analysis was conducted to compare the attributes of the kabau plant used in this study with those of the previous research conducted by [2] and is summarized in Table 1 for reference.

**Table 1.** Characteristics of the kabau plant

| **Plant Characteristics** | **Observed plants** | ***Archidendron jiringoides* [2]** | ***Archidendron bubalinum* [2]** |
|---|---|---|---|
| Number of Seeds | 10 | 10-12 | 1-9 |
| Seed Arrangement | Protrude | Protrude | No gaps |
| Seed Thickness | 2,6 cm | 1.3-1,8 cm | 0,5-1,5 cm |
| Seed Diameter | 3 cm | up to 3 cm | 0,8-2,5 cm |
| Seed pod Length | 23 cm | 18 cm | 4-8 cm |
| Seed pod Diameter | 3,5 cm | 3,5-4 cm | 1.3-3 cm |
| Seed pod Shape | Full circle | Half or full circle | Straight or slightly curved |
| Seed pod Colour | Dark green | Purplish green or dark green | Green |
| Inner seed pod Colour | Reddish brown | Reddish brown | Reddish brown |
| Leaf Colour | Green | Green | Green |
| Leaf arrangement | Spiral | Spiral | Alternatus spiral |
| Petiole Length | 1 cm | 1-2 cm | 1-2 cm |
| Twig shape | Protrude | Protrude | Pole |
| Twig Color | Light brown | Light brown | Light brown |

*Archidendron jiringoides* is categorized under the Archidendron genus. This botanical entity is frequently encountered in the region of Sumatra, particularly within the confines of the South Lampung area [2].

### 3.2 Phytochemical Test on Kabau Seed Pod Extract (*Archidendron jiriogoides* Komariah)

The assessment of phytochemical constituents within the kabau seed pod aimed to delineate its secondary metabolite composition. The phytochemical examination of the kabau seed pod extract encompassed a series of tests, including evaluations for flavonoids, alkaloids, saponins, phenolics, tannins, steroids, and triterpenoids. The outcomes of the phytochemical analysis conducted on the kabau seed pod extract are documented in Table 2. The phytochemical evaluation of the kabau seed pod extract revealed the presence of flavonoids, saponins, phenolics, tannins, and triterpenoids. However, no alkaloids or steroids were detected.

**Table 2.** Phytochemical test of Kabau seed pod extract

| Test Type | Results | Description |
|---|---|---|
| Flavonoids | + | There was a change in the color of the filtrate to reddish-orange |
| Alkaloids | - | No alteration in the color of the filtrate occurred. |
| Saponins | + | Foam emerged as a result. |
| Phenolics and Tannins | + | The filtrate assumed a blackish-blue hue. |
| Steroids | - | No transformation of the filtrate into green or blue was observed. |
| Triterpenoids | + | The filtrate's color transitioned to reddish-orange. |

Flavonoids, phenols, and tannins present in the kabau pod extract exhibit promising antioxidant potential. As affirmed by [10], the phytochemical constituents comprising flavonoids, phenols, tannins, and alkaloids possess inherent antioxidant properties. Notably, flavonoid compounds are adept at curbing and inhibiting oxidation reactions, both enzymatic and non-enzymatic. They play a pivotal role in sequestering hydroxyl and superoxide radicals, thereby safeguarding membrane lipids from deleterious reactions. On the other hand, phenols and tannins bear hydroxyl groups that readily contribute electrons, thereby effectively counteracting the detrimental impact of free radicals [11].

### 3.3 Antioxidant Activity Assessment

The antioxidant activity assessment provided a potential kabau seed pod extract for a new source of antioxidant resources. This measurement of antioxidant activity with DPPH (2,2-diphenyl-1-picrylhydrazyl) is presented as $IC_{50}$ value. The results reveal a clear pattern: as the concentration of the extract increases, the recorded absorbance values decrease. This correlation between the extract concentration and the resulting percentage of inhibition is visually represented by a standard curve that illustrates the DPPH inhibition by the kabau seed pod extract, as shown in Figure 1.

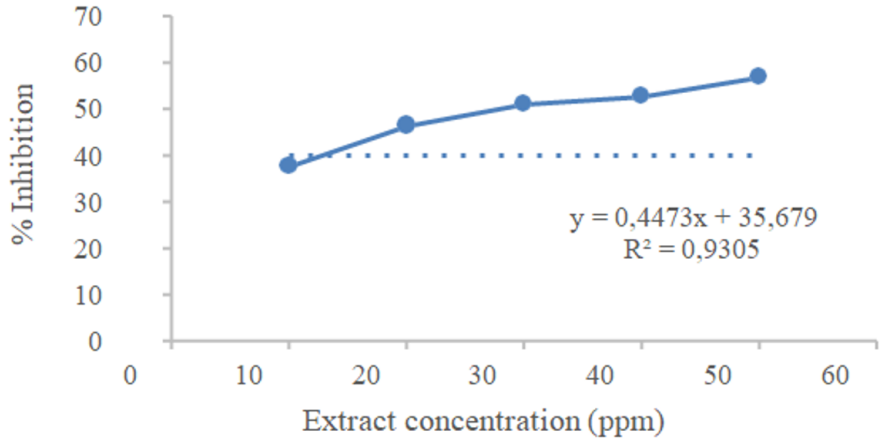


**Fig. 1.** DPPH scavenging activity curve by seed pod extract

The standard curve depicting the DPPH inhibition by kabau seed pod extract yields an equation of y = 0.4473x + 35.679, accompanied by an R2 value of 0.9305. Under this equation, the $IC_{50}$ value for the kabau rind extract is determined to be 32.01 µg/ml. This inference underscores the robust antioxidant efficacy embedded within the kabau seed pod extract.

The examination of antioxidant activity within the kabau seed pod extract, as conducted in this study, culminates in the disclosure of an $IC_{50}$ value of 32.01 µg/ml. According to [12], compounds fall within the very strong antioxidant activity if their IC50 value is <10 µg/ml; those with $IC_{50}$ values spanning 10-50 µg/ml are deemed to exhibit strong antioxidant activity. Compounds with IC50 values of 50-100 µg/ml are classified as having weak antioxidant activity, while those with $IC_{50}$ values exceeding 100 µg/ml are categorized as possessing very weak antioxidant activity. The manifestation of an $IC_{50}$ value of 32.01 µg/ml in the kabau seed pod extract firmly classifies it as a compound evincing strong antioxidant potential, thereby poised to combat free radicals within the body. A series of studies on the *Archidendron* genus yield concordant outcomes regarding antioxidant activity. *Archidendron pauciflorum* demonstrates robust activity, yielding an $IC_{50}$ value of 91.97 µg/ml [13]. Similarly, [14] expounded that *Archidendron bubalinum* presents moderate antioxidant activity, marked by an $IC_{50}$ value of 273.57 ppm. The alignment between these findings and the phytochemical screening data reinforces the hypothesis that the presence of antioxidant activity can be attributed to the abundance of flavonoid compounds, saponins, tannins, phenolics, and triterpenoids within the skin extract of *Archidendron jiringoides* from South Lampung Regency.

## 4 Conclusions

This study presented the morphological characteristics of *Archidendron jiringoides* from South Lampung Regency. The seed pod extract from kabau presented positive contents of flavonoids, saponins, phenolics, tannins, and triterpenoids. Remarkably, the antioxidant activity of the extract was strong with an $IC_{50}$ value of 32.01 µg/ml. This was a notable antioxidant candidate.

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