Traditional Medicinal Plants in Bima Communities: A Bacterial Activities Test and Phytochemicals

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Abstract. The use of medicinal plants in Bima communities has been widely practiced for a long time by parents and ancestors, however, this was usually not based on scientific understanding of the chemical contents in those medical plants. Consequently, in determining the standard amount of dosage relies on experience and hereditary habits. The purpose of this study was to determine the antibacterial and phytochemical activity test of traditional medicinal plants in Bima community. Samples of medicinal plants used were Muntingia calabura, Phyllanthus urinaria, Ageratum conyzoides, Manilkara zapota and Momordica charantia. The results indicate that Muntingia calabura and Ageratum conyzoides contain alkaloid compounds, flavonoids, trpenoids, saponins and tannins with concentrations of 20.40 and 60 ml which have the ability to inhibit the activity of Staphylococcus aureus by producing an inhibitory zone that is classified as a very well with an average radius of the inhibition zone 14.47 ± 0.40 mm. Whilst, the phytochemical test result of medicinal plant extracts show that 4 plant samples contain flavonoid compounds, 1 sample does not contain flavonoids, 4 samples contain alkaloid compounds, 5 samples contain steroid compounds and terpenoids, 4 samples contain saponin compounds, and 1 sample does not contain saponins.

1. Introduction

The communities in Bima Regency have already known various types of plants that have medicinal substances which can cure various diseases. Consumption of medicinal plants has been practiced for a long time by parents and ancestors who developed and yielded a local wisdom in Bima. Local wisdom was in the form of habits or culture in the use of values and substances of medicinal plants and these kinds of habit can be found in several countries such as China, Korea, and Japan [1].

The habit of consuming traditional medicinal plants has long been developed by the communities in Bima Regency in the form of herbs. In addition, they use and consume medicinal plants for the purpose of treatment to various diseases, however, this was usually not based on a standardized of scientific understanding of phytopharmacology about the chemical content of medicinal plants. Thus, in determining the standard amount of dosage in the use of traditional medicinal plants, they only rely on experience and habitual behavior levels and this might cause medicinal substances do not work effectively [2]. To find out the content of secondary metabolites in medicinal plants that are beneficial and useful for body health, a bacterial activity and phytochemical screening test should be carried out.
2. Method

Tools and materials used in this study were analytical scales, glassware, refrigerators, electrical cones, books, cameras, writing, filter paper and another laboratory equipment. The types of traditional medicinal plants tested in this study are *Muntingia calabura, Phyllanthus urinaria, Ageratum conyzoides, Manilkara zapota, and Momordica charantia*. While, the ingredients used are n-hexane, ethyl acetate and methanol, distilled water and sulfuric acid.

Sample extraction was carried out by maceration using methanol as a solvent. Materials in the form of roots, stems and dried leaves that have been cut into small pieces weighing 20g soaked with 350 ml of methanol for 24 hours, then filtered with cotton filtering. This was repeated 3 times until the filtrate was clear. Then each type of extract was concentrated with a rotary evaporator at a temperature of 35°C. The extract was weighed to find out the extract yield. After extract was obtained, antibacterial activity test would be conducted.

This study conducted the anti-bacterial activity test phase. The sample extract was dissolved in a methanol solvent at a concentration of 100 mg / ml (10 μg / μl). Antibacterial activity test was carried out using the disc method. On sterilized blank disc paper, pipette as much as 20 μl (50 μg extract), 40 μl (100 μg extract), 60 μl (200 μg extract) and then dried for 30 minutes at room temperature in laminar air flow to remove solvents. After being dried, it was placed on medium so that Mueller Hinton was inoculated with Staphylococcus aureus test bacteria. As a control group, the treatment was made without containing test of the extracts.

Observation Stages of Anti-Bacterial Activity were made after incubation for 24 hours at 37°C [3]. The antibacterial activity of the test extract was characterized by the presence or absence of clear zones / regions formed around the disc paper. The diameter size of the inhibition area showed high or low ability of medicinal plants extracts in inhibiting the growth of *S. aureus bacteria*.

Phytochemical Screening Test Stages is each sample of the plant was washed and dried, then ground until the texture was being smooth. Each sample was macerated (immersed) in methanol for 24 hours. Then, a filter was carried out to separate the methanol extract from the pulp, which was tested in alkaloids, flavonoids, steroids, terpenoids and saponins.

3. Result

3.1. Antibacterial Activity Test

Methanol extract from traditional medicinal plants *Muntingia calabura, Momordica charantia, Phyllanthus urinaria, Ageratum conyzoides* and *Manilkara zapota* appeared to inhibit the growth of *Staphylococcus aureus* bacteria. The results of inhibition zone diameters can be seen in Table 1 and Figure 2.

| Bacterial were tested | Extract concentration (mg/mL) | Replication 1 | Inhibit zone (mm) Replication 2 | Replication 3 | Average |
|-----------------------|-------------------------------|---------------|---------------------------------|---------------|---------|
|                       |                               | Replication   |                                 |               |         |
|                       |                               | 1             |                                 |               |         |
| Staphylococcus aureus | 20                            | 10,25         | 10,74                           | 10,53         | 10,50±0,24 |
|                       | 40                            | 12,91         | 12,12                           | 12,53         | 12,46±0,39 |
|                       | 60                            | 14,12         | 14,94                           | 14,35         | 14,47±0,40 |
| Negative control      | 0                             | 0             | 0                               | 0             | 0       |
| Positive control      | 13                            | 17            | 20                              | 11,33±0,29    |
The results of bacterial activity tests at each concentration of plant extracts showed that methanol extracts containing alkaloids, flavonoids, saponins and tannins can inhibit the activity of Staphylococcus aureus. Inhibition zone diameters in Table 1 and Figure 2 identified that ethanol extract has more effective than controls extracts. Methanol extract showed the best inhibition zone diameter with an average inhibition zone radius of 14.47 ± 0.40 mm, while the control inhibition zone diameter of 0 mm. This was due to methanol extracts have more alkaloids, flavonoids, terpenoids, saponins and tannins than controls extract, consequently, it affected the zone of bacterial growth inhibition. According to previous study [3], medicinal plants that contain alkaloids and flavonoids with 75% compound concentration can inhibit the activity of Salmonella bacteria.

According to Agustina [5], tannin and flavonoid compounds in traditional medicinal plants have the ability to inhibit the process of bacterial activity, while alkaloid compounds, saponins and tannins can act as antibacterial because they can interfere with the synthesis of peptidoglycan, therefore, the formation of cell walls of bacteria Staphylococcus aureus and Escherichia coli [6]. The action mechanism of tannin compounds as antibacterial was related to the target of tannin against polypeptide damaged which has been found in bacterial cell walls, thereby disrupting the synthesis of peptidoglycan which effect the formation of cell walls and inactivation of bacterial cells in host cells [7]. Alkaloid compounds, flavonoids, terpenoids, saponins and farmers can be considered as disinfectant by denaturing proteins that can cause a destruction of bacterial cell in metabolic activity [8]. Flavonoids cause damage to bacterial cell wall permeability and inhibit bacterial motility [4]. Flavonoids and saponins also attack cell wall polypeptides and causing damage to cell walls in bacteria. Saponins have molecules that can attract water and dissolve fats or lipophils, so they can reduce the tension in cell surface which ultimately causes the destruction of bacteria.
### Table 2. Phytochemical Screening Result from the Medicinal Plants in Bima Communities

| Sample       | Latin Name       | Alkaloid | Flavonoid | Steroid/Terpenoid | Saponin | Tanin |
|--------------|------------------|----------|-----------|-------------------|---------|-------|
| Kersen       | Muntingia calabura | +        | +         | +/-               | +       | +     |
| Pare         | Momordica charantia | -        | -         | +/-               | +       | +     |
| Meniran      | Phyllanthus urinaria | +        | +         | +/-               | +       | +     |
| Bebandotan   | Ageratum coryzoides | +        | +         | +/-               | +       | +     |
| Sawo Kelik   | Manilkara zapota  | +        | +         | +/-               | -       | +     |

**Note:** + : contain compounds tested. - : do not contain compound tested

### Figure 3. Number of Frequencies of Compounds Detected in Medicinal Plants

#### 3.2. Phytochemical Screening Results of Traditional Medicinal Plants

The lack of flavonoid and terpenoid compounds in the phytochemical test results was due to the fact that some terpenoids have a cyclic structure in the form of alcohol which cause these compounds to tend to be semipolar so that their bond with the polar methanol solvent was very weak [9]. Terpenoid compounds have medicinal and antimalarial effects [10]. Several types of steroid compounds, including estrogen, is a type of steroid used for contraception, inhibiting ovulation, as an anti-inflammatory, allergic, fever, leukemia and hypertension [11]. According to Kissnger [12], saponin compounds can be used as antiseptics and natural antibiotics where the saponin content in medicinal plants has the ability to kill germs, inhibit bacterial activity, eliminate pain, maintain immunity and as antibiotics [13].

#### 4. Conclusion

Based on the findings, it can be concluded that:

a. Methanol extract from roots, stems and leaves of medicinal plants *Muntingia calabura* and *Ageratum coryzoides* can inhibit the growth of *S. aureus* bacteria at concentrations of 20 μg, 40 μg, and 60 μg and positive control of 50 μg.

b. Phytochemical screening results of methanol extracts in medicinal plants which have been analyzed indicate that 4 samples contain alkaloids, 4 samples contain flavonoids, 5 samples contain steroids, 2 samples contain terpenoids, 4 samples contain saponins and 5 samples contain tannins

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