

# Exploration of Medicinal Plants in Pamekasan District: Ethnobotany Study in Herbal Medicine to Prevent Symptoms of Tuberculosis Infection

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## Abstract

Tuberculosis occurs in many developing countries, one of them is in Indonesia. This disease emergence is due to a lack of understanding by the community to treat the mild diseases that are symptoms of tuberculosis. Then, Madurese people have a well-recognized culture of traditional medicine. For its effectiveness, traditional medicine from Madura becomes renowned. Several plants have been used by Madurese community, which are potentially bioactive as anti-inflammatory and anti-tuberculosis. RFI was used to evaluate the data from the interviews to find out which plants are most effective in treating symptoms of Tuberculosis (TB). The aim of this study was to determine the types of plants used by the community to prevent symptoms of TB in the Pamekasan district. The method used in this study is a descriptive qualitative approach by interview techniques. Based on the study's findings, it can be inferred that the *Magnolia champaca* plant was the most popular among respondents. *Magnolia champaca* is processed according to a specific prescription as a traditional medicine for treating tuberculosis symptoms.

## Keywords

Ethnobotany, Symptoms of Tuberculosis, *Magnolia champaca*.

## 1. Introduction

The knowledge of Indonesian people on the efficacy of plants is based on the knowledge and experience of people from their ancestors. This knowledge handed down from generation to generation. The Madurese people uphold the traditional medicine culture. Traditional medicine culture through herbal has an interest in the last decade (Mudjijono, dkk., 2014). Based on empirical studies, it has been known that the Madura tribe is the only tribe who still uses traditional medicine to prevent through herbal formulation. Furthermore, the efficacy of Madura herbal medicine has been known by the wider community. Jamu Madura is not only used for mother and child health but also to treat diseases (Handayani, 2008). Madurese has a wide variety of traditional medicines. They have knowledge about disease classification, medicinal properties, treatment methods, body caring method, and medicinal plant species. Several types of medicinal plants used to reduce heat, cough medicine, vaginal discharge, itching in infants, and high blood pressure (Destryana, 2019). Madura Island divided into four districts i.e. Sumenep, Pamekasan, Bangkalan, and Sampang. Each district

has a different culture of traditional medical treatment. Pamekasan is one of the famous districts in Madura Island that has twenty-five Madura herbal medicine companies (Nurlaila, 2013). Pamekasan District has regosol, Mediterranean, and lithol alluvial soil types. Soil types can affect the physical and chemical properties of the soil. These properties can affect the composition and chemical content of medicinal plants at Pamekasan. Pamekasan has three sub-districts i.e. Pagantenan, Larangan, and Waru, which are the biggest manufacturers of medicinal plants. The Traditional medicine industry is widely available in these districts. However, most Pamekasan people plant crops at home, but some people plant crops on plantations (Suryawati & Murniyanto, 2011).

Chronic cough is one of the symptoms of tuberculosis. Another symptom can be determined by shortness of breath, chest pain, decreased appetite, and weight loss, which can be identified as an early diagnosis of tuberculosis. The disease is caused by a bacterial infection of *Mycobacterium tuberculosis* (TB). TB not only attack the lungs but also can attack other organs. TB disease can be transmitted through saliva or water (Safithri, 2017). Tuberculosis is one of the leading causes of death. This disease caused by the degree of anemia, which is affected by Fe deficiency (Gil-Santana et al., 2019). In this study, we want to explore the types of plants that are used to prevent and treat diseases in the surrounding community.

## 2. Material and Methods

### *Research Location*

The research was performed there in Pagantenan subdistrict of Pamekasan Madura Regency for three weeks on using medicinal plants for the symptoms of TB disease.

### *Research Object*

The objects were people who were selected in the Pagantenan district and used medicinal plants.

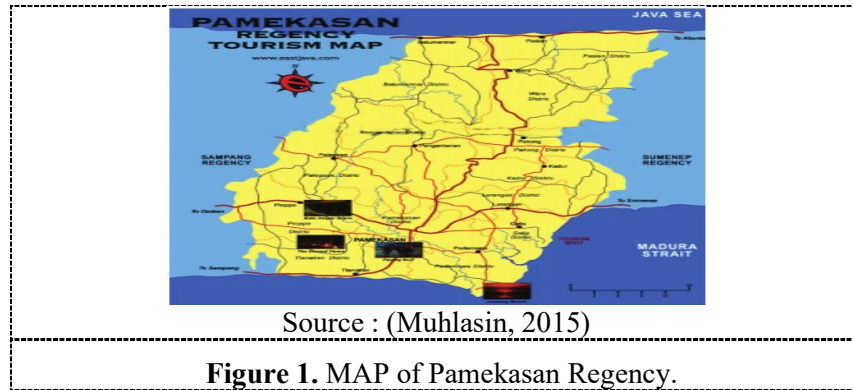
### *Data collection*

The data has been in the form of the community medicinal plant names used in Pagantenan for the prevention and treatment of diseases. The data is medicinal plant data for symptoms of tuberculosis using Pagantenan people reinforced from journal and book studies. Data on the use of selected medicinal plants are also available.

## 3. Result and Discussion

### *3.1. Madurese Culture in Pamekasan*

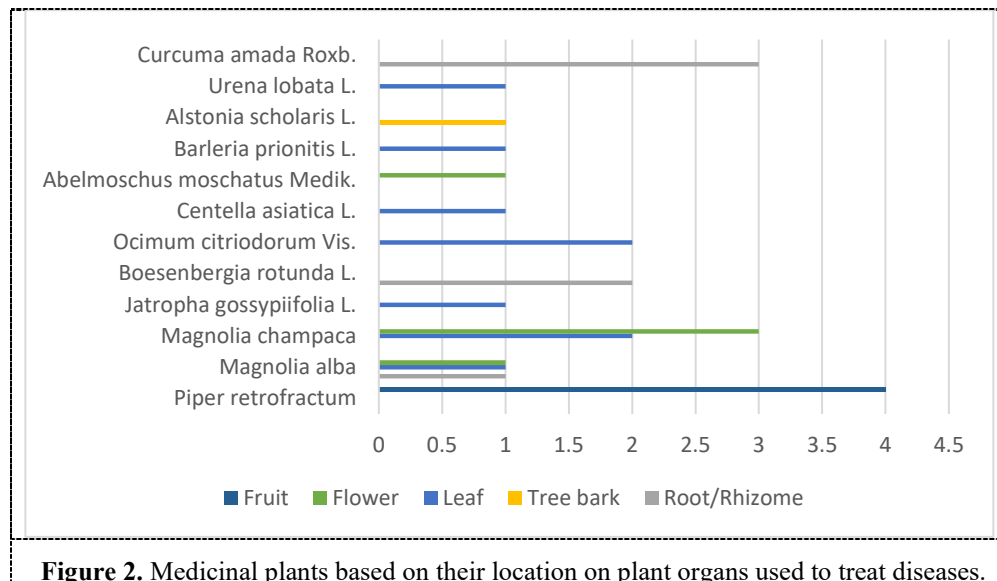
Pamekasan Regency has an area of up to 17,230 Ha, with administrative boundaries of Pamekasan Regency in the north of the Java Sea, east of Sumenep Regency, south of the Madura Strait, and west of Sampang Regency. Topographically, the Pagantenan district is located at an altitude of 350 meters above sea level. This district is the highest plateau in the Pamekasan district. Based on demographic data, the population of Pamekasan Regency are 795,918 people with the livelihoods of people farming, trading, raising livestock, civil servants, entrepreneurs, and others. One of the main commodities of community plantations in Pamekasan Regency is Cabe Jamu, with a total production of 45.85 tons/year with an area of 558.50 tons / Ha. The productivity of chili herbs is 924.00 kg/ha. Chile herbal medicine is one of the medicinal plants in Pamekasan Regency which is classified as a local superior variety (Muhlasin, 2015).



The culture of drinking herbal medicine is a heritage. It was applied by the Madurese community since adolescence. In general, this tradition has been applied in the family and Madura community. It is more commonly introduced to children from an early age, although there are herbs for men and treating diseases (Satriyati, Ekna.Biroli, 2019).

### 3.2 Medicinal Plants in Pamekasan

Based on the results of interviews with 25 respondents (key informants) who are the makers of herbal medicine, medicinal plants (Figure 2) used by surrounding communities in the treatment of diseases. Most people use medicinal plants for the health of mothers and children, especially the family Piperaceae and Zingiberaceae. The Piperaceae family, specifically the *Piper retrofractum* Vahl., is one of the main commodities of the Pamekasan district community. In addition to mother and child health, some Magnoliaceae family plants are used by the community for the treatment of coughs and fevers which are symptoms of tuberculosis. More respondents than other plants have been selected for magnolia champaca then the parts to be used are flowers and leaves. This plant is planted by the local community in the yard of the house. The plant part of the Magnoliaceae family that is often used by the community in making herbal medicine is the flower. It because flowers contain several secondary metabolites such as flavonoids, triterpenoids, terpenoids and carotenoids which can be used as antituberculosis and anti-inflammatory (Wahyu Ashri Aditya, 2018; Widowati et al., 2005).



### 3.3 Active Compounds Involved in the Mechanism of Tuberculosis

The data in figure 2 shows some medicinal plants found in the Pamekasan district containing active compositions containing sesamin, Chabamide, Pellitorine, Flavonoids, Terpenoids, Polyphenols, and Triterpenoids that contain anti-inflammatory, antibacterial, and antituberculosis related to TB. The active compound which works as antibacterial works directly by inhibiting action or through the metabolism of the system (Barh et al., 2013; Ariantari et al., 2015). Besides, it also anti-tuberculosis such as Triterpenoid through specific inhibition, which involves several enzymatic reactions to fight *M. tuberculosis* bacteria. The disease due to bacterial infection *Myobacterium tuberculosis* also caused by the body's defense system. Anti-inflammatory activity is related to the body's defense against bacterial infection of *M. tuberculosis* (Ananthi & Chitra, 2013).

In general, *Myobacterium tuberculosis* infection can affect the degree of anemia. The degree of anemia is not only caused by iron deficiency but also inflammation (Kuo-An Chu, et al., 2019). It caused by pro-inflammatory IL-6 Nf-alpha, IFN-gamma, IL-12, and IL-1beta (Alimuddin Zumla, et al., 2014). Besides, *M. tuberculosis* infection affects changes in anti-inflammatory cytokines IL-4 and IL-10 in neutrophil cells. Th-1 cell response is more dominant and protective in someone who has symptomatic TB, besides the anti-inflammatory cytokine IL-10 secretion is also increased, this can increase Th-2 cell response in someone with symptomatic TB (Gideon et al., 2019).

**Table 1.** The active Compounds of Effective Medicinal Plants for TB

Species	Family	Active Compounds	Ref.
<i>Piper retrofractum</i> Vahl.	Piperaceae	Sesamin	(Bodiwala et al., 2007)(Muharini et al., 2015)
		Chabamide	(Bodiwala et al., 2007)(Muharini et al., 2015)
		Pellitorine	(Rukachaisirikul et al., 2004) (Bodiwala et al., 2007)
<i>Magnolia alba</i> D.C.	Magnoliaceae	Alkaloid	(Wang et al., 2010)
<i>Magnolia champaca</i> D.C.	Magnoliaceae	Flavonoid and Terpenoid	(Ariantari et al., 2015)(Ananthi & Chitra, 2013)
		Polifenol and triterpenoid	(Gupta et al., 2011)
<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	Flavonoid	(Panda et al., 2009)
<i>Centella asiatica</i> L.	Mackinlayaceae	Triterpenoid	(Orhan, 2012)(Gohil et al., 2010)(James & Dubery, 2009)
		Flavonoid	(Nagarajan et al., 2016)
<i>Abelmoschus moschatus</i> Medik.	Malvaceae	Flavonoid	(Pawar & Vyawahare, 2017)
<i>Barleria prionitis</i> L.	Acanthaceae	Flavonoid	(Khobragade & Bhande, 2012)
<i>Alstonia scholaris</i> L.	Apocynaceae	Flavonoid	(Khyade et al., 2014)
<i>Curcuma amada</i> Roxb.	Zingiberaceae	Terpenoid	(Policegoudra et al., 2011)
<i>Ricinus communis</i> L.	Euphorbiaceae	Flavonoid and Terpenoid	(Abdul et al., 2018)

### 3.4 The study of Tuberculosis treatment based on the results of scientific studies and ethnobotany studies

Until now, the use of antibiotics such as Isoniazid and Rifampicin in the process of treating TB disease raises resistance to TB. These results caused TB treatment is inefficient. Besides, prolonged treatment, high pill doses, low patient compliance, and rigid administrative schedules are the causes of MDR-TB and XDR-TB cases. Fluoroquinolone antibiotics and aminoglycoside injections are second-line anti-TB drugs that are also in their development resistant to TB. TB resistance to MDR-TB and XDR-TB results in the emergence of TDR-TB. WHO has not officially recognized the type of TDR. Nonetheless, treatment with antibiotics

is limited, more expensive, toxic, and less effective (Nasiruddin et al., 2017). Moreover, an inactive form then converted into an active form by OS on the host (nitric oxide and S-oxidation) and pathogens (catalase enzyme and EthA). Then, TB has developed to survive, causing a high OS burden on the host. It also can increase NADH / NAD<sup>+</sup> in bacteria, increase intracellular survival protein (Eis), peroxiredoxin, superoxide dismutase, and catalase (Shastri et al., 2018). Antioxidants in the form of isolates can provide benefits for TB inhibition but can also have an impact on increasing TB virulence. Based on the data in table 2, it is known that *P. retrofractum*, *M. champaca*, and *A. scholaris* species in Pamekasan Regency have the potential for the treatment of TB disease through the mechanism of killing the growth of *M. tuberculosis* bacteria, based on table 2.

**Table 2.** The Potential Plants for Tuberculosis Treatment.

Medicinal Plants	Family	Antituberculosis / Treatment of TB Symptoms	Ref.
<i>Piper retrofractum</i> Vahl.	Piperaceae	Antituberculosis	(Rukachaisirikul et al., 2004)
		Antituberculosis	(Rukachaisirikul et al., 2004) (Muharini et al., 2015)
<i>Magnolia champaca</i> D.C.	Magnoliaceae	Anti-tuberculosis	(Ariantari et al., 2015)
<i>Alstonia scholaris</i> L.	Apocynaceae	Anti-tuberculosis	(Khyade et al., 2014)

Ethnobotany study is very important, especially to overcome the diseases causes by bacterial resistance, so herbal remedies are needed. Therefore, ethnomedical practice is needed so that medical staff can serve patients more broadly based on their needs. This requires a comprehensive information system so that herbal medicine information can be received by the medical community. Some fields of science that are represented in the future relating to medical ethnobotany, such as cultural competence in providing health services to migrants, biocultural conservation initiatives, Phyto-pharmacovigilance, and drug discovery are being developed in Europe (Pardo-de-Santayana et al., 2015). Ethnobotany studies of medicinal plants have also been carried out in Indonesia. Based on the results of studies in local communities, it is known that some of the plants used in the treatment of tuberculosis symptoms. Ethnobotany research used to treat TB has also been carried out by other countries such as Laos. Some plants from the family Rutaceae, Euphorbiaceae, and Apocynaceae have been used by the community in the treatment of tuberculosis 37(Elkington et al., 2014). Based on the results of the field of study in table 1, the three families have been used by local communities in treating diseases, especially for the health of mothers and children. It shows the cultural characteristics of the Madurese community in consuming medicinal plants that have been applied early and starting from the family environment.

### 3.5 Madura Herbal Medicinal Technique for Treating Tuberculosis

According to the data in table 3, Madura herbal medicine's compounding technique is known to treat diseases with TB symptoms. Some diseases that are symptoms of tuberculosis are inflammation of the respiratory tract, prolonged cough, and fever. So that the benefits of medicinal herbs can be felt by the body's benefits, then the use of medicinal plants must be adapted to compounding techniques and types of

disease. Madura herbal concoction has been passed down from generation to generation and has become a culture of traditional medicine for local people. The data in Table 3 are advanced information from Table two data with one of the most interviewed plants for Antituberculosis (figure 2). Five respondents selected *Magnolia champaca*, thus continuing to smooth through the community experience with the traditional use of plants in the treatment of TB symptoms.

**Table 3.** Herbal medicine techniques for treatment.

Disease	Composition of herbal medicine	Compounding Techniques
Inflammation of the respiratory tract	<i>Magnolia champaca</i> flowers + honey	15 grams of dried <i>Magnolia champaca</i> flowers are added with enough water then boiled, boiled water added honey to taste and drink
Whooping cough and phlegm	<i>Magnolia champaca</i> flowers + ginger rhizome + honey	7 grams of yellow cempaka flowers added 10 grams of ginger rhizome boiled in 3 cups water until boiling then honey is added
Fever	<i>Magnolia champaca</i> leaves	15-60 grams of <i>Magnolia champaca</i> leaves boiled in 3 cups of water until boiling.

The Madurese community in Pamekasan district uses yard-cultivated plants and that have been cultivated by farmers in Pamekasan district to make medicinal herbs. The plant parts used are roots, bark, leaves, flowers, and fruit. The community also uses local wild plants in making herbal medicine. Some of these plants are cultivated by the community so, become not extinct and can be used as additional material in compounding Madura herbal medicine (Zainol Arifin, Fitrah Yulawati, 2016).

#### 4. Conclusion

Based on the results of this study, 12 plants are known to be used by the community for disease prevention and treatment. The results of the reference study are known to have antituberculosis capability for *Piper retrofractum*, *Magnolia champaca* and *Alstonia scholaris*. *Magnolia champaca* is traditionally used in Traditionally people as symptoms of tuberculosis, whooping cough and phlegm, inflammation of the respiratory tract and fevers for respiratory tract infections.

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