

ANTIBACTERIAL AND ANTIFUNGAL ACTIVITIES OF *Impatiens balsamina* (L.): LITERATURE REVIEW ARTICLE

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## ABSTRACT

The human body contains a diverse range of microorganisms, including bacteria and fungi. The most common bacteria and fungi caused skin pathogens are *Staphylococcus aureus*, *Propionibacterium acnes*, *Staphylococcus epidermis* and *Candida albicans*. Many studies have found that *Impatiens balsamina* (L.) contains antibacterial and antifungal activities. Acne and Candidiasis are diseases that often arise and can interfere with comfort for sufferers. Usually, acne is caused by the bacteria *Propionibacterium acnes*, *Staphylococcus epidermis* and *Staphylococcus aureus*, and Candidiasis caused by the *Candida albicans*. One of the plants that is widely used as an antiacne and antifungal treatment is the *Impatiens balsamina* (L.). *Impatiens balsamina* (L.) has antiacne and antifungal activities. The purpose of the review is to find out if the *Impatiens balsamina* (L.) has activity as an antiacne, antifungal and can identify secondary metabolites that can inhibit the emergence of bacteria in acne and candidiasis in various journals. The method used is the Literature Review Article (LRA) method. A search through Google Scholar and Pubmed found 12 articles that *Impatiens balsamina* (L.) contains secondary metabolites, namely flavonoids and saponins. The mechanism of action of flavonoids is by inhibiting the function of cell membranes and energy metabolism of bacteria, while the mechanism of action of saponins as antifungals is by damaging cell membranes, causing cell leakage which ultimately leads to cell death. From the two mechanisms, these secondary metabolites can have antiacne and antifungal activities.

**Keywords:** Antiacne, Antifungi, *Impatiens balsamina* (L.), Flavonoid, Saponin

## INTRODUCTION

Acne vulgaris is a disease that often arises and disturbs adolescents (Knutsen-Larson et al., 2012). The main factors that cause acne include increased sebum production, follicular hyperkeratinization, colonization of *Propionibacterium acnes* bacteria, and inflammation (Wendy et al., 2014). In adolescence, the prevalence of acne is quite high, ranging from 47-90%. Acne can affect the quality of life of sufferers by giving bad psychological effects, this disease is not life-threatening but detrimental because it is associated with decreased self-confidence due to reduced facial beauty of sufferers. Acne can occur due to blockage of the pilosebaceous and inflammation triggered by the bacteria *Propionibacterium acnes*, *Staphylococcus epidermidis* (Murtiningsih et al., 2014) *Staphylococcus aureus* (Saputra et al., 2019).

In addition to bacteria, fungi are also often studied for testing the activity of medicinal plants, including *Candida albicans*, which is a normal flora in the digestive tract, female genital tract, and skin. Infection by *Candida albicans* is acute and subacute known as candidiasis. Ketoconazole is commonly used in the treatment of candidiasis is an antifungal drug. The use of ketoconazole is not recommended in patients with liver disorders because it is hepatotoxic (Siddik et al., 2016). In addition to antifungal treatment, there are also anti-acne preparations on the market that contain synthetic antibiotics such as erythromycin and clindamycin, but not a few have side effects such as irritation, long-term use can cause resistance and even organ damage and immune hypersensitivity (Ismarani et al., 2014). The occurrence of resistance causes the failure of therapy, to avoid resistance, alternative treatments against acne and fungi are chosen, namely from natural ingredients derived from plants (Wendy et al., 2014).

One of the plants used as an antiacne and antifungal is *Impatiens balsamina* (L.). Empirically, the *Impatiens balsamina* (L.) has many benefits from its parts such as leaves, flowers, seeds and stems that can be used as medicine (Murtiningsih et al., 2014). In addition, the *Impatiens balsamina* (L.) contains secondary metabolites, namely flavonoids, naphthoquinones, quinones, and saponins (Ismarani et al., 2014). Flavonoids are secondary metabolites that are believed to have antimicrobial effects (Hardiana et al., 2020).

*Impatiens balsamina* (L.) also contains antimicrobial active compounds, namely antibacterial, antifungal which functions to prevent bacterial growth (Hardiana et al., 2020). *Impatiens balsamina* (L.) extract also has antibacterial activity that causes acne, namely polyketide (naphthoquinone) and flavonoid (quercetin and kaempferol) compounds (Dermawan et al., 2016). These compounds have antibacterial activity and provide other activities such as antifungal or antifungal both from seeds, flowers, leaves, and roots (Naitullah et al., 2014). Chemical compounds that act as antifungals are saponins. Saponins include compounds that are insoluble in water but soluble in alcohol groups such as ethanol so that in the

form of extracts the active ingredient content can dissolve and work as antifungals (Dwi Angraeeni et al., 2019).

## MATERIAL AND METHODS

This research is a qualitative research using Literature review article (LRA). The data collection process was carried out through a database with topics related to antiacne and antifungal activities in *Impatiens balsamina* (L.) was published from 2011 to 2021.

## RESULTS AND DISCUSSION

*Impatiens balsamina* (L.) is an annual herbal plant from the Balsamineaceae family which is cultivated as an ornamental plant. *Impatiens balsamina* (L.) contains active compounds, namely flavonoids, quinones, saponins, and coumarins which have activities such as antifungal, antibacterial, antidermatitis, antianaphylactic, and antihistamine (Su et al., 2012). From the results of the Literature Review, Article *Impatiens balsamina* (L.) has anti-acne activity, namely the bacteria *Propionibacterium acnes*, *Staphylococcus aureus*, and *Staphylococcus epidermis*. Apart from being an anti-acne, the water-loving plant also has antifungal or antifungal activity, namely the fungus *Candida albicans*.

The results of the literature review of this article, the stems, leaves, and flowers of the water henna plant use the disc diffusion method with an inhibition zone of more than 10 mm containing secondary metabolites, especially flavonoids that can inhibit the development of microorganisms in acne-prone skin by inhibiting the capacity of the cell layer. and digestion of bacterial energy. While resisting the action of the cell film, flavonoids form a complex mixture with extracellular proteins that can damage the bacterial cell layer, followed by the entry of an intracellular mixture of microbes. Flavonoids can inhibit energy digestion by suppressing oxygen by microorganisms. Energy is needed by microorganisms for macromolecular biosynthesis so that if digestion is suppressed, bacterial particles cannot form complex atoms (Sapara et al., 2016), while the *Impatiens balsamina* (L.) seeds contain optional metabolites, especially saponins that can inhibit the development of microscopic organisms in skin inflammation. The system of activity of saponins as antibacterial is to cause spillage of proteins and catalysts from bacterial. Saponins are dynamic substances that can build a layer of penetrating power so that cell hemolysis occurs. When saponins interact with bacterial cells, microorganisms will break down or lyse.

**Table 1** Antibacterial Activities

No	Bacteria	Parts of Plant	Method	Zone of Inhibition Test	Secondary Metabolites	Formula Preparation	Reference
1.	<i>Propionibacterium acnes</i>	stems and leaves	Disk diffusion method	17,42 ± 3,029 mm.	Flavonoid	Cream	(Wendy et al., 2014)
2.	<i>Propionibacterium acnes</i> and <i>Staphylococcus epidermis</i>	stems and leaves	Disk diffusion method	<i>P. acne</i> : 16,13 mm ± 0,35 mm <i>S. epidermis</i> : 11,23 ± 3,33 mm	Flavonoid	Gel	(Ismarani et al., 2014)
3.	<i>Staphylococcus aureus</i>	leaves	Well diffusion method	12 ± 2 mm	Flavonoid	Peel-off	(Saputra et al., 2019)
4.	<i>Propionibacterium acnes</i> and <i>Staphylococcus epidermis</i>	leaves	Disk diffusion method	<i>P. acne</i> : 11,66±1,08 mm <i>S. epidermis</i> : 15,20 ± 0,37 mm	Flavonoid	Gel	(Murtiningsih et al., 2014)
5.	<i>Propionibacterium acnes</i> and <i>Staphylococcus epidermis</i>	leaves	Disk diffusion method	<i>P. acne</i> : 11,66 + 1,331 mm <i>S. epidermis</i> : 15,20 + 0,460 mm	Flavonoid	Cream	(Dermawan et al., 2016)
6.	<i>Staphylococcus aureus</i>	Flowers and seeds	Disk diffusion method	Flowers : 17,16 mm Seeds : 5,66 mm	flowers : Flavonoid seeds: Saponin	Extracts	(Made et al., 2015)
7.	<i>Staphylococcus epidermis</i>	leaves	Disk diffusion method	15.16 ± 0,75 mm	Flavonoid	Patch	(Adiaswati et al., 2020)
8.	<i>Staphylococcus aureus</i>	leaves	Well diffusion method	> 10mm	Flavonoid	Peel-off	(Mahyun et al., 2018)
9.	<i>Staphylococcus aureus</i>	flowers	Disk diffusion method	6,6 mm	Flavonoid	Soap	(Dimpudus et al., 2017)

**Table 2** Antifungal Activities

No	Fungi	Parts of Plant	Method	Zone of Inhibition Test	Secondary Metabolites	Formula Preparation	Reference
1.	<i>Candida albicans</i>	Leaf	Well diffusion method	13,83 mm	Saponin	Shampoo	(Malonda et al., 2017)
2.	<i>Candida albicans</i>	Leaf	Well diffusion method	22,2 mm	Saponin	Nail Polish	(Dwi Angrraeni et al., 2019)
3.	<i>Candida albicans</i>	Leaf	Disk diffusion method	13,66±1,52	Saponin	Extracts	(Naitullah et al., 2014)

In addition to treating acne, *Impatiens balsamina* (L.) leaves are also used as an antifungal with good spreading and circular distribution techniques using the *Candida albicans* parasite, which is known to have an inhibition zone of more than 10 mm. It is remembered for solid classification and has additional metabolite compounds, being specific saponins which are known to be soluble in alcohol and insoluble in water, so that in the dosage form the extract contains soluble active ingredients and works as an antifungal that can kill the fungus *Candida albicans*. The mechanism of action of saponins as antifungals is to damage the cell layer, causing cells to spill which in turn causes cell death or apoptosis.

## CONCLUSION

*Impatiens balsamina* (L.) contains secondary metabolites, namely flavonoid and saponin compounds and has activity as an antiacne and antifungal by inhibiting cell membrane function and energy metabolism, and can increase membrane permeability resulting in hemolysis in cells, and also has activity as antifungal with the mechanism of damaging cell membranes, which can cause cell leakage which in turn triggers apoptosis or programmed cell death.

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