Systematic literature review: potential anti hyperglycemia Imperata cylindrica

Erna Sulistyowati1, Muhammad Rofif Aziz1

ABSTRACT

Introduction: Imperata cylindrica or cogon grass can be found throughout the world. This wild plant, which is considered a weed, has several properties including anti-diabetic, antihypertensive, anti-diuretic, anti-inflammatory, and antioxidant properties. This review article aimed to discuss the anti-diabetic effects of I. cylindrica.

Methods: There were 12 full text articles published from 2005 to 2021 which were relevant for review. Through in vitro and in vivo studies which show that the active compounds of I. cylindrica have the potential to be anti-diabetic agents.

Results: Several studies have shown that I. cylindrica has phenolic compounds, flavonoids and tannin which have antioxidant effects. Flavonoids as antioxidative properties prevent cell damage caused by free radicals reactive. By donating their hydrogen atoms or the ability to adhere metals, in the form of glucosides or a form called aglycones so that they can reduce blood glucose levels. I. cylindrica was processed as extracts or decoction.

Conclusion: It was concluded that I. cylindrica is the potential to have an anti-diabetic effect.

INTRODUCTION

Diabetes itself is a metabolic syndrome that occurs as a result of insulin secretion disorders characterized by hyperglycemia due to insulin secretion abnormalities, and insulin damage, even the body does not produce insulin or insulin is not used effectively. Because the presence of hyperglycemia can also lead to the risk of blood vessel disease.1

Pharmacotherapy for diabetes mellitus uses synthetic drugs as a priority. However, synthetic drugs can cause various kinds of side effects, some examples of side effects include nausea, vomiting, hypoglycemia, lactic acidosis, and vitamin B12 insufficiency. One alternative medicine derived from herbal plants that can reduce the side effects of synthetic drugs is Imperata cylindrica.2

The medicinal plant Imperata cylindrica is indigenous to southwest Asia as well as the tropical and subtropical regions. From I. cylindrica, 72 chemical components have been extracted and identified to yet. Saponins, flavonoids, phenols, and glycosides are the main components of these substances. Analyses of I. cylindrica’s pharmacological properties have shown that this edible medicinal herb has a wide variety of therapeutic potential, including immunomodulatory, antibacterial, anticancer, anti-inflammatory, and liver-protective effects both in vivo and in vitro.3

This review is aimed to provide an overview of the potential of anti-hyperglycemia Imperata cylindrica in in vitro, and in vivo.

METHOD

Sample of Research

This research sample is a journal that has been appropriate or meets the criteria of inclusion and exclusion set in the review. The criteria for inclusion and exclusion in systematic literature review are as follows.

1. Inclusion criteria:
   a. In vivo, and in vitro that evaluate the potential of anti-hyperglycemia Imperata cylindrica.
   b. International Journals using the UN language
   c. National Journal in English or Indonesian
   d. Journal issued in 2005-2021
   e. Original article

2. Exclusion criteria
   a. Secondary articles or journals, such as review articles or reviews
   b. Journal cannot be accessed full text
   c. The journals published below are not good with the certainty of Jadad scale ≤ 3, Newcastle-Ottawa Scale (NOS) ≤7, and Cochrane Risk of Bias Tool by looking at the provisions of low risk bias ≤3, high risk bias (X) ≥2, and unclear (?) ≥4.

Instrument and Procedures

The database used for data search is PubMed Central and Google scholar. Researchers use the following keywords: Imperata cylindrica OR cogongrass AND hyperglycemia; Imperata cylindrica OR cogongrass AND glucose AND white blood cell; and Imperata cylindrica OR cogongrass AND diabetic mice. The data that has been obtained from the search with keywords is then imported into the library. In this step, the duplicate is manually removed whenever the reviewer finds it. All excluded literature must be given an exclusion reason according to...
Data Analysis
After obtaining the journal in accordance with the inclusion-exclusion criteria, conducted a bias assessment. In the clinical trial articles the bias assessment uses three assessment scales: Jadad, Newcast Ottawa Scale (NOS), and Cochrane Risk of Bias Tool. Determining the validity of the journal is seen through the parameters of Jadad score ≥3, Newcast Ottawa Scale (NOS) ≥7, and Cochrane by looking at the low risk bias (✓) ≥3, high risk bias (X) ≤2, and unclear (?) ≤4. If two of the three scales state well then the journal is valid. While in the article in vivo bias assessment uses the Cochrane Risk of Bias Tool.

Once a valid journal is retrieved, the extracted research article data includes the author’s name, journal publish year, type of research, samples used, the originator of hyperglycemia, the derivative product Imperata cylindrica used dosage of use, measured parameters and the outcome obtained. The author also extracts the parameters for the purposes of assessing biases Jadad scale, Newcast Ottawa Scale (NOS), and Cochrane Risk of Bias Tool. After that, the conclusion is made in accordance with the results of the journal that has been obtained.

RESULTS
Our Pubmed central and google scholar researches were founded in a total of 1479 articles. Then after elimination of duplicate articles from both databases as many as 246 articles remained 1233 articles. Next 1233 this article will be filtered using exclusion criteria. 421 journals are eliminated because they are not original articles where some are books and the rest are reviewed articles. 736 further articles in elimination on the grounds that the title and abstract do not correspond to the topic of research and 22 journals in elimination even from the title and abstract meet the criteria but cannot be accessed the full article. The remaining 64 journals were then filtered using review inclusion criteria. At this stage, there are 52 articles that are eliminated because some discuss the effects of other herbs on hyperglycemia and some discuss the

| Table 1. Cochrane Risk of Bias Tool article bias analysis result. |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| **No** | **Author** | **Year** | **Random Sequence Generation** | **Allocation concealment** | **Blinding of Participant and Personnel** | **Blinding of Outcome Assessment** | **Incomplete Outcome Data** | **Selective Reporting** | **Other Bias** |
| 1 | Ruslin et al | 2020 | v | v | ? | x | x | x | x |
| 2 | Mirisiti A et al | 2020 | v | v | ? | x | x | x | x |
| 3 | Aprilita Rina Yanti Eff et al | 2020 | v | v | ? | x | x | x | x |
| 4 | Novikoe MO et al | 2019 | v | v | ? | x | x | x | x |
| 5 | Neni Anggraeni et al | 2005 | v | v | ? | x | x | x | x |
| 6 | Irene M Villaseor et al | 2012 | v | v | ? | x | x | x | x |
| 7 | CUI Jue dkk | 2021 | v | v | ? | x | x | x | x |
| 8 | Bikash Kafle et al | 2021 | v | v | ? | x | x | x | x |
| 9 | A Zada et al | 2018 | v | v | ? | x | x | x | x |
| 10 | Nimpa et al | 2016 | v | v | ? | x | x | x | x |
| 11 | B. Jayaprasad d Thamayandhi et al | 2011 | v | v | ? | x | x | x | x |
## Table 2. Valid Journal Extraction Results.

| No | Author                        | Year | Type of research | Sample                                      | Inducer                                      | Product of Imperata cylindrica | Dose                        | Parameters Measured | Outcome             |
|----|-------------------------------|------|------------------|---------------------------------------------|----------------------------------------------|--------------------------------|--------------------------|---------------------|---------------------|---------------------|
| 1  | Ruslin. et al                 | 2020 | In vivo          | Wistar strain rats which had 170–200 g weight | KTM-100 injection (0.4 ml/200 g bw)         | Root                          | 90 mg/kgBW              | Blood Glucose Level   | ↓                   | ND                  | ND                  |
| 2  | Mu’nis A., et al              | 2020 | In vivo          | Wistar strain rats which had 20–25 g weight | Aloxan (120 mg/kg BB)                        | Root                          | 125 and 250 mg/kgBW     | Blood Glucose Level   | ↓                   | ND                  | ND                  |
| 3  | Aprilita Rina Yanti Eff., et al | 2020 | In vitro        | Larvae of shrimp Artemia salina             | 5 ml of dimethyl sulfoxide (DMSO)           | Root                          | Blood Glucose Level      | ↑                   | ND                  | ↑                   | ND                  |
| 4  | Nwokile MO., et al            | 2020 | In vivo          | 200 adult male rats weighing between 150 and 200 grams | Alloxan monohydrate (150 mg/kg)          | Aqueous Extract of Imperata cylindrica Root | Blood Glucose Level      | ↓                   | ND                  | ND                  |
| 5  | Neni Anggraeni., et al        | 2019 | In vivo          | Eight weeks old of male balb/c mice (Mus musculus) | STZ (streptozotocin) dose 130 mg/kgBW       | Root                          | 90 and 115 mg/kgBW       | White Blood Cell       | ↑↓                  | ND                  | ND                  |
| 6  | Irene M. Villasenor., et al   | 2005 | In vivo          | Male Swiss Webster mice, 18–28 g             | Oral administration of 7% glucose solution/20 g mouse | Root                          | 5 mg/20 g mouse          | Blood Glucose Level    | ↓                   | ND                  | ND                  |
| 7  | Cui Jue., et al               | 2012 | In vivo          | Male mice                                   | STZ (streptozotocin)                        | Root                          | Low dose and High dose   | Blood Glucose Level    | ↓                   | ND                  | ND                  |
| 8  | Bikash Kafle., et al          | 2021 | In vivo          | Female Wistar rats, weighing 150–210 g, about the age of 30 day | Water ad libitum                          | Root                          | 100 mg/kg and 250 mg/kg | Blood Glucose Level    | ↓                   | ND                  | ND                  |
| 9  | A Zada., et al                | 2018 | In vivo          | Eight to ten weeks old of male balb/c mice (Mus musculus) | STZ (streptozotocin) dose 50mg/KgBW        | Root                          | 90 and 115 mg/kgBW       | Nitrit Oxide           | ↑                   | ND                  | ND                  |
| 10 | Mu’nis A., et al              | 2017 | In vivo          | Mice                                        | Alloxan monohydrate, and the dose 120 mg/kg | Plant                          | 500 mg/kgBW              | Blood Glucose Level    | ↓                   | ND                  | ND                  |

**Abbreviation:** ND: No Data ↓: Decreased ↑: Increased; BGL: Blood Glucose Level; WBC: White Blood Cell; NO: Nitrit Oxide
effects of *Imperata cylindrica* on other diseases. Finally obtained 12 articles that were then conducted validation tests.

**Article Bias Analysis**

In this parameter, the analysis bias in in vivo test using Cochrane Risk of Bias Tool, while in clinical trials using Cochrane Risk of Bias Tool, Jadad scale, and Newcastle-Ottawa Scale (NOS) which is then summarized in Table 1 and Figure 1.

The scale rating above uses an article bias assessment based on the Cochrane Risk of Bias Tool. This assessment scale uses 7 aspects of comparison which include Random Sequence Generation, Allocation concealment, Blinding of Participant Personnel, Blinding of Outcome Assessment, Incomplete Outcome Data, Selective Reporting, and Other Bias. Each assessment parameter has its own task, starting from assessing sample grouping, the bias that can occur in participants or experimental animals, data submission, and several other aspects.

**Potential anti-hyperglicemia of *Imperata cylindrica***

Table 2 is a summary of the results of a systematic literature review of the potential of *Imperata cylindrica* as an anti-hyperglicemia. The journals used were 12 international journals of in vivo and in vitro types. The year used to limit the search for journals in this study starts from 2005-2021. From 12 journals, 1 journal from 2005, 1 journal from 2011, 1 journal from 2012, 1 journal from 2016, 1 journal from 2017, one journal from 2018, one journal from 2019, 2 journals from 2020, and 1 journal from 2021. Not all journals focus on one plant, namely *I. cylindrica*, but there are several journals that also compare other plants to the performance of *I. cylindrica*. The doses used also vary, there are some studies that use one dose and are given a different time span, and some are giving different doses at the same time. Of the 12 journals used, there are also 2 different forms of experimental research, namely 1 in vitro journal and 11 in vivo journals. While the outputs of each journal include 9 journals that discuss the effect of *I. cylindrica* on blood sugar levels, 1 journal that discusses the effect of *I. cylindrica* on white blood cells, 1 journal that discusses the effect of *I. cylindrica* as an alpha-glucosidase inhibitor, and 1 journal that discusses the effect of *I. cylindrica* on Nitrite Oxide.

**DISCUSSION**

The reported pharmacological, phytochemical, and pharmacological actions of the plant *I. cylindrica* are summarized in the current review. There have been 72 compounds from *I. cylindrica* discovered so far, the main components of which are flavonoids and saponins. The principal bioactive components of *I. cylindrica* are lignans and flavonoids, which may contribute either directly or indirectly to the biological effects of the *I. cylindrica* genus, according to publications on the bioactivities of extracts and compounds from this plant. The bioactivities of *I. cylindrica* plants have been demonstrated by studies carried out through in vivo and in vitro investigations, the majority of which support their traditional medical applications. Pharmacological research focuses mostly on substances that have anti-inflammatory, anticancer, antiviral, antioxidant and liver-protective properties.

From a total of 12 journals were obtained, they are divided into 4 topics. The first as many as 7 journals that discuss the effect of *I. cylindrica* on blood sugar levels, it can be concluded that *I. cylindrica* has an effect on reducing sugar levels significantly. *I. cylindrica* contains polyphenols, flavonoids and tannins which have an effect as radical scavenging and can lower blood sugar levels through the anti-oxidant pathway.

The journal belonging to Neni Anggraeni, el al which discusses the effect of *I. cylindrica* as an anti-inflammatory, it can be concluded that *I. cylindrica* has a significant anti-inflammatory effect at a certain dose because flavonoids are known as anti-inflammatory. Journal of Aprillita Rina Yanti Eff., et al which discusses the effect of *I. cylindrica* as an alpha-glucosidase inhibitor, it can be concluded that *I. cylindrica* has an effect as an alpha-glucosidase inhibitor with a certain dose.

The journal belonging to A Zada., et al which discusses the effect of *I. cylindrica* on NO (Nitrit Oxide), it can be concluded that *I. cylindrica* has the effect of increasing Nitrit Oxide with a certain dose. Some of the content of *I. cylindrica* are polyphenols, flavonoids and tannins which have the effect of increasing NO through the anti-oxidant pathway.

The limitation of this review is that it does not carry out further analysis to determine the significance of the research findings used in the review. Therefore, a further systematic review is needed, accompanied by more studies and a more detailed analysis.
CONCLUSIONS
This study concluded that *I. cylindrica* has potential as an antihyperglycemic agent. This can be seen from the decrease in blood sugar levels, its effect as an anti-inflammatory, increasing alpha glucosidase inhibitors, and increasing NO in vivo studies after administration of *I. cylindrica*. However, because articles that examine this matter are still difficult to find, it is hoped that further research can be carried out on the potential of *Imperata* as an antihyperglycemic agent.

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CONFLICT OF INTEREST
There is no conflict of interest for this manuscript.

ETHICAL CONSIDERATION
This study has been declared ethical by the Ethical Commission for Health Research of the Universitas Islam Malang.

REFERENCES