



## Indonesian Plants with Potential as an Anti-Diabetes Mellitus Agent

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### ABSTRACT

Diabetes Mellitus (DM) is a degenerative disease that continues to increase in number in Indonesia and is a disease that is spread throughout the world due to unbalanced nutritional conditions. Treatment of diabetes mellitus is a chronic and lifelong treatment. Treatment of diabetes mellitus, such as the use of insulin and oral antihyperglycemia drugs, is relatively expensive, is used for a long time and can cause unwanted side effects. There are many plants that have potential as antihyperglycemia drugs. One of the active compounds that act as antihyperglycemia is flavonoids. Flavonoids derived from various types of plants studied are thought to act as antihyperglycemic agents. Flavonoids are known to have the ability to scavenge free radicals or act as natural antioxidants. The antioxidant activity of flavonoids is related to phenolic -OH groups which can capture or neutralize free radicals (such as ROS or RNS). Flavonoids can play a role in pancreatic tissue damage caused by DNA alkylation due to alloxan induction as a result of improving the morphology of the rat pancreas.

### 1. Introduction

Diabetes mellitus is a collection of various kinds of syndromes characterized by increased blood sugar levels (hyperglycemia), changes in fat, carbohydrate, and protein metabolism, and an increased risk of complications of cardiovascular disease. Diabetes mellitus (DM) is a degenerative disease that continues to increase in number in Indonesia and is a disease that is spread all over the world due to unbalanced nutritional conditions. The prevalence and incidence of Type II Diabetes Mellitus continue to increase in both developed and developing countries. Diabetes mellitus treatment is a chronic and lifelong treatment. Treatment of diabetes mellitus, such as the use of insulin and oral antihyperglycemic drugs, is relatively expensive, is used for a long time, and can cause sources found the effective dose, the plant parts used, and the compound content of several plants to provide

unwanted side effects. Therefore, it is necessary to look for effective drugs with low prices and relatively low side effects, namely herbal medicines derived from plants.<sup>1-5</sup>

### 2. Methods

The process of searching for article sources was obtained by searching on google, google scholar, and NCBI with the keywords "antihyperglycemic", "antihyperglycemic in the rat" and "antihyperglycemic in rats". The primary data sources used are national journals and international journals published during the last 15 years.

### 3. Results and Discussion

The results of the analysis from various journal an antihyperglycemic effect. Secondary metabolites from various plants studied contain antioxidants,

namely flavonoids. Flavonoids derived from various kinds of plants studied are thought to act as antihyperglycemic agents. Flavonoids are known to have the ability to scavenge free radicals or act as natural antioxidants. The antioxidant activity of flavonoids is related to phenolic –OH groups which can capture or neutralize free radicals (such as ROS or RNS). Flavonoids can play a role in pancreatic tissue damage caused by DNA alkylation due to alloxan induction as a result of improving the morphology of the rat pancreas. Flavonoids are reported to have an antidiabetic activity that can regenerate cells on Langerhans islands. With the improvement of Langerhans cells, the amount of insulin produced will increase so that blood glucose will enter the cells and a decrease in blood glucose occurs in the body. Flavonoid compounds are one of the antioxidant compounds that are thought to be able to restore the sensitivity of insulin receptors in cells resulting in a decrease in rat blood glucose levels. Flavonoids isolated from bananas have the potential to activate insulin receptors on cells and become an alternative choice for the treatment of type II diabetes mellitus in patients with insulin resistance. Based on a review of the source of review data obtained, the parameters examined in Antihyperglycemia testing include testing of blood sugar levels and pancreatic histopathology. Testing of blood sugar levels can be done using the enzymatic method with GOD PAP reagent and can use a glucometer instrument. Meanwhile, pancreatic histopathology observation is done by looking at the

damage to Langerhans cells using a microscope. used divided into several treatment groups to see differences in results, namely the negative control group, the positive control group, and the test group. As a comparison, oral antihyperglycemic drugs were used, one of which was glibenclamide from the sulfonylurea which has a mechanism of action to stimulate insulin secretion. Rats used as experimental animals must first be conditioned to hyperglycemia by various induction methods. The usual hyperglycemia induction using alloxan. Alloxan is one of the diabetogenic substances that are toxic, especially to pancreatic beta cells and if given to experimental animals, the experimental animals can become diabetes. The mechanism of damage to pancreatic beta cells by alloxan begins with the oxidation of sulfide groups and the formation of free radicals. Alloxan reacts with two -SH groups that bind to the sides of the protein or amino acid to form a disulfide bond, thereby inactivating the protein which results in disruption of the protein function. Alloxan induction at a dose of 125 mg / Kg BW intraperitoneally was able to increase glucose levels in rats until they reached a hyperglycemic state with blood glucose levels > 135 mg / Dl. In addition to using alloxan, the induction of experimental animals to experience hyperglycemia can use streptozotocin (STZ) at a dose of 50 mg / Kg BW. Streptozocin has an advantage over alloxan because STZ has selective cytotoxicity to pancreatic beta cells so it is less toxic than alloxan.<sup>6-14</sup>

No	Plant Name	Used Plant Parts	Effective dosage	Compound content
1	<i>Pandanus amaryllifolius</i>	Leaf	600 mg/kg BB	Tannins, alkaloids, flavonoids, and polyphenols
2	<i>Gardenia augusta</i> , Merr	Leaf	250 mg/kg BB	Flavonoid saponins and polyphenols
3	<i>Peperomia pellucid</i> [L] kunth	Herb	40 mg/kg BB	alkaloids essential oil flavonoids phytosterols, cardiac glycosides, tannins and anthraquinones
4	<i>Solanum melongena</i> L	Fruit	100 mg/kg BB	Anthocyanin
5	<i>Syzygium alternifolium</i>	Seed	50 mg/kg BB	Flavonoids and phenols
6	<i>Berberis aristata</i>	Root	250 mg/kg BB	berberine, berbamin and palmatine
7	<i>Catharanthus roseus</i>	Leaf	100 mg/kg BB	Flavonoids and alkaloids
8	<i>Cuminum cyminum</i>	Seed	600 mg/kg BB	Flavonoids
9	<i>Solanum xanthocarpum</i>	Leaf	200 mg/kg BB	Phosphorus, nitrogen, potassium, magnesium, manganese, zinc, calcium and sulfur
10	<i>Psidium guajava</i>	Fruit	250 mg/kg BB	Polyphenolic compounds such as protocatechuic acid, ferulic acid, quercetin, guavin B, myrecetin, ellagic acid, gallic acid, apigenin routine and vitamin C
11	<i>Cyclocarya paliurus</i>	Leaf	8 g/kg BB	Flavonoids and polysaccharides
12	<i>Tetracera scandens</i> Linn. Merr	Leaf	0.26 g/kg BB	Flavonoids 3.5 – diprenylgenistein 6.8 direnlygenistein, derone and alpinumisoflavones
13	<i>Hypericum perforatum</i>	Leaf	200 mg/kg BB	Routine and flavonoids such as quercetin and isoquercetin

#### 4. Conclusion

There are many plants that have the potential as antihyperglycemic drugs. One of the active compounds that act as antihyperglycemic is flavonoids.

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