

# Antidiabetic Activity of Banana Peel Extract : Effect on Hyperglycemia, Hyperlipidemia and Augmented Oxidative Stress in Diabetes Mellitus

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## Abstract

Diabetes mellitus is one of the common metabolic disorders acquiring around 2.8% of the world's population and is anticipated to cross 5.4% by the year 2025. In 2012, the number of diabetes sufferers in Indonesia ranked as the seventh largest number of diabetics as many as 7.6 million and according to the WHO the prevalence of diabetes cases will continue to rise up to 154% in 2030. Since long back herbal medicines have been the highly esteemed source of medicine therefore, they have become a growing part of modern, high-tech medicine. From the review it was suggested that banana peel contained large amounts of dopamine and L-dopa, catecholamines with a significant antioxidant activity. The banana peel also shown the ability as antioxidants to prevent the oxidation of fish oil and might be considered as rich sources of natural antioxidant. Thus, from the review majorly, the antidiabetic activity of banana peel is attributed to the presence of pectin (10-21%), lignin (6-12%), cellulose (7.6- 9.6%), and hemicellulose (from 6.4 to 9.4%) which show reduction in blood glucose levels. Another research shown that pectin can also against hypercholesterolemia with decreasing total cholesterol, LDL cholesterol and HDL cholesterol.

**Keywords:** Banana Peel Extract, Antidiabetic activity, Diabetes mellitus, Pectin

## 1. Background

Diabetes mellitus, one of the most common endocrine metabolic disorders has caused significant morbidity and mortality due to microvascular (retinopathy, neuropathy, and nephropathy) and macrovascular (heart attack, stroke and peripheral vascular disease) complications (Patel, 2011). In 2012, the number of diabetes sufferers in Indonesia ranked as the seventh largest number of diabetics as many as 7.6 million and according to the WHO the prevalence of diabetes cases will continue to rise up to 154% in 2030 (IDF 2012; Soewondo et al., 2012).

Data from the Ministry of Health said that the first rank of patients hospitalized from all endocrine disease is diabetes mellitus. Diabetic Federation estimates that the number of people with diabetes mellitus in Indonesia in 2008, there were 5.6 million diabetics for age above 20 years, will increase to 8.2 million in 2020, when no effort healthy lifestyle changes patients (Tandra, 2008). Based on Murray research (2000), every 19 minutes there one person in the world who had a stroke, there is one person who is blind and no one people in the world amputated due to complications of diabetes mellitus (Maulana, 2008). Insulin resistance is the basis of diabetes mellitus, and failure  $\beta$  cells begin to occur before the development of diabetes is the occurrence imbalance between insulin resistance and insulin secretion (ADA, 2008). Meanwhile, a major obstacle in the use of insulin is its use by injecting and the price is relatively expensive (PB PAPDI, 2013). That currently available therapy has a number of serious adverse effects (Saxena, 2004).

This disease control in Indonesia led to the need for alternative treatment to control these diseases. Recently, some medicinal plants have been reported to be useful in diabetes worldwide and have been used empirically in antidiabetic and antihyperlipidemic remedies. Antihyperglycemic activity of the plants is mainly due to their ability to restore the function of pancreatic tissues by causing an increase in insulin output or inhibit the intestinal absorption of glucose or to the facilitation of metabolites in insulin dependent processes (Malviya, 2010). One material that has potential as an antidiabetic activity is banana peel.

## II. Method

This paper uses a descriptive qualitative approach, literature study as a method of data collection.

### III. Result

Banana peel is a waste material (waste of bananas) that quite numerous in Indonesia and the banana peel number is approximately 1/3 of an unpeeled banana. Banana peel has a complete nutrition such as carbohydrates, fats, protein, calcium, phosphorus, iron, vitamin B, vitamin C and water (Munadjim, 1988). From the review it was suggested that banana peel contained large amounts of dopamine and L-dopa, catecholamines with a significant antioxidant activity. The banana peel also shown the ability as antioxidants to prevent the oxidation of fish oil and might be considered as rich sources of natural antioxidant.

The other element of banana peel are pectin (10-21%), lignin (6-12%), cellulose (7,6- 9.6%), and hemicellulose (from 6.4 to 9.4%) (Arunakumara, 2013). Pectin is a polymer of D-galacturonic acid linked by  $\alpha$ -1,4 glycosidic bond. A form of pectin extracted is a white powder until light brown. Most of carboxyl groups on the pectin polymers undergo esterification with methyl (methylation) into a methoxyl group. This compound is called as pectinat acid or pectin. Pectinat acid along with the sugar and acid in High temperatures will form a gel as it did in the manufacture of jam (Hariyati, 2006). Pectin from banana peel can be extracted with a simple way, the cost is not expensive and can be applied on a small scale (Hasbullah, 2001).

Chauhan, et al. (2010) based from their research said that a pectin type polysaccharide obtained from the banana peel extract exhibited hypoglycemic activity in normal and streptozotocins induced diabetic mice by stimulating the secretion of insulin and reducing the glycogen content in the mice. Another study from Story, et al. (1981) shown that pectin has been convincingly reported to reduce hepatic TG and/or total lipid/fat contents in rats fed various steatogenous diets. For example, 85% hepatic TG content reduction has been reached by supplementing the diet with 5% lignin in high-cholesterol fed (1%) rats.

As we know diabetes is a disease in which blood glucose (sugar) levels are higher than normal. Over time, too much glucose in the blood can lead to increased plaque deposits on the insides of the blood vessel walls. The most typical lipid pattern in diabetes consists of high triglyceride levels, low HDL levels, and small, dense LDL particles, which easily stick to artery walls. This lipid pattern is linked with central obesity and insulin resistance. From thus, banana peel extract that reduce the number of glucose, triglyceride, and total lipid and also has antioxidant ability can be used as a therapy for type 2 diabetes.

### IV. Conclusion

As a result, we obtained conclusion that banana peel extract can be used as an alternative therapy for type 2 diabetes. Moreover, further comprehensive chemical and pharmacological investigation are needed to elucidate the exact mechanism of antidiabetic activity and the dose of banana peel extract that can be useful for the therapeutic purposes, and in the future we could make plant-based food (PBF) from this material.

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