Antidiabetic Effect of Swietenia Macrophylla Seeds on Type I Diabetes Subjects

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Abstract: The antidiabetic effect of Swietenia macrophylla (Sky Fruit) seeds was evaluated in Diabetic type I Patients (Human). In this paper, we have studied the antidiabetic effects of Swietenia Macrophylla on Human i.e. Men and Women. Methanol extract of Swietenia macrophylla seeds was administered orally and capsules filled at different doses for different human for different days. The results were plotted on charts and effect of Swietenia Macrophylla was calculated.

Keywords: Swietenia Macrophylla, Dabetes, Glucose Level

I. INTRODUCTION

Diabetes mellitus is a complex heterogeneous metabolic disorder affecting nearly 4% of the population worldwide and is expected to increase by 5.4% in 2025 .In experimental diabetes model, chemical induction with streptozotocin diminished insulin production and causes high levels of blood circulating glucose, which was similar as found in human diabetics . The altered physiological function of the pancreas from the action of streptozotocin provides the signs of abnormalities in pancreatic islets function and morphology and is defended by an increased in oxidative stress markers reported in pancreatic islet.

Natural products are defined as the compounds isolated from nature which can be extracted from various natural sources such as plant, animal, marine, and microbes). The history of the extraction of natural products have long been known since Mesopotamian and Egyptian times, where people produce perfumes or pharmaceutically-active oils and waxes as their business.

Before the introduction of insulin in 1922, the treatment of diabetes mellitus relied on dietary measures which included the use of traditional plant therapies. Many traditional plants were successfully used for the treatment of diabetes. Though the active principles of various classes of chemical compounds have been isolated from plants, some remain to be identified. The World Health Organization has recommended that traditional plant treatments for diabetes warrant further evaluation. An antidiabetic agent could exert a beneficial effect in the diabetic situation by enhancing insulin secretion and or by improving/mimicking insulin action.

Medicinal plants are defined as the plants that contain therapeutic properties. Plants constitute one of the major raw materials of drugs, which have been used in treating various human diseases over thousands of years. In ancient time, plants were used in foodstuffs with curative properties that help mankind to sustain its health, as well as applied as herbal remedies to treat certain diseases.

For the study, we have selected one medicinal plant. The Plant is described below:

Plant of Interest:

Family: Meliaceae

Meliaceae, or known as Mahogany family which shows Sapindales as order. It is a flowering plant family that consists of trees and shrubs, where the plants range in size from magnificent forest trees to small shrubs. The family Meliaceae consists of 575 species in 50 genera of trees and shrubs, which are mostly found in tropical to subtropical region. Limonoids and terpenoids are isolated as the major chemical constituents in Meliaceae plants. The major biological activities shown by most of the species are cytotoxic activity, antimicrobial activity, anti-feedant and anti-malarial activity.

Genus: Swietenia

Swietenia is only found in the neotropics region. It consists of three species, which are Swietenia mahagoni Jacq, Swietnia humilis Zucc. and Swietenia macrophylla King. Two natural hybrids are also found in some regions where the two species overlap, which are the cross between Swietenia macrophylla and Swietenia humilis and cross between Swietenia macrophylla and Swietenia mahagoni.

Swietenia macrophylla King:

Botany Name and Common Names:

Botany name of the plant is Swietenia macrophylla King., commonly known as cheria mahogany, "pokok tunjuk langit" or "sky fruit" in Malaysia due to the upward trend of its fruits towards the sky. The plant commonly known as big-leaved mahogany in England, Mahoni in Indonesia.

Distribution:

Swietenia macrophylla King is found mainly in tropical region, which inhabits both wet and dry forests. It grows natively throughout the tropical regions of America, naturally distributed from southern Mexico, through Central America, to the northern South America. It is also found in west India, Malaysia and Southern China.

Morphology

Tree of *Macrophylla* is in medium sized to large tree taller than 30 m. The bark of the tree is dark reddish brown, and the leaves are up to 35 to 50 cm, with 4 to 6 pairs of leaflets. The flowers are small yellow-cream colored panicles.

The flowers are unisexual, with staminate and pistilate flowers which are insect-pollinated, and have a functional self-incompatibility system.

The fruit is woody, light brown color with usually 5-lobed capsule. Fruit is commonly known as sky fruit as it usually point upward towards the sky. The fruits split open from the apex or the base when they are ripe and dry.

Seeds are hanging from the columella by their wing, usually with 35 to 45 seeds per fruit. The seeds are brown in colour, oblong, compressed, crested and extended into a wing at attachment end, which has 7.5 to 15 cm long including the wing, with extensive air spaces. The seeds are dispersed by wind. Flowering and fruiting is distinctly seasonal for this species.

Taxonomic Classification:

Kingdom	**Plantae**
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Sapindales
Family	Meliaceae
Genus	Swietenia
Scientific name	Swietenia macrophylla
Species authority	King

Biological Activities:

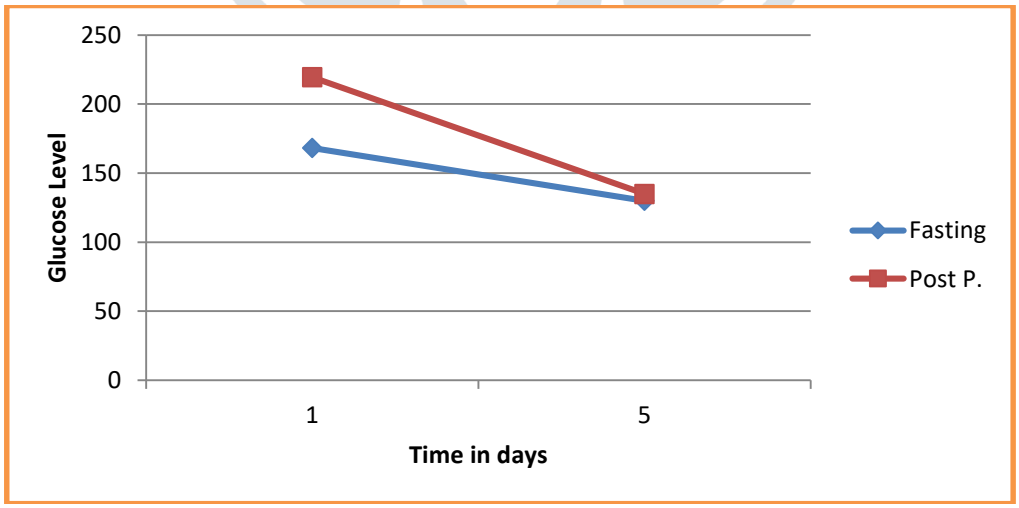
1. Antidiabetic Activity
2. Antioxidant Activity
3. Antimicrobial Activity
4. Anticancer and Antitumor Activity
5. Antidiarrhoel Activity
6. Antimalarial Activity
7. Antihypertensive Activity
8. Increases Strength

II. METHODOLOGY

Generally any study of natural medicinal plant is done on animals prior to human, after successful study on animals, we marched to humans. In this study we studied effects of medicinal plant i.e. Swietenia Macrophylla on different humans. For this study we have to choose one or more parts of plant, we chosen seeds of Swietenia Macrophylla.
One difficulty of intake of Swietenia Macrophylla seeds is that it's bitter taste and its presence at least one day after intake in mouth.

For that we have given the Swietenia Macrophylla to humans in two different ways, i.e. orally without capsules and other one is within the capsule. We have given the Swietenia Macrophylla seeds to men and women in different proportion, different way and for different time duration.
Case I: when dose of 500 mg without capsule filled daily for 5 days
In this case we have given Swietenia Macrophylla seeds to 56 yrs old diabetic man 500 mg orally for consecutive 5 days.

	Fasting Glucose Level	Post Prandial Glucose Level	Duration
Before	168.35 mg/dl	219.50 mg/dl	5 days
After	130.00 mg/dl	135.00 mg/dl	

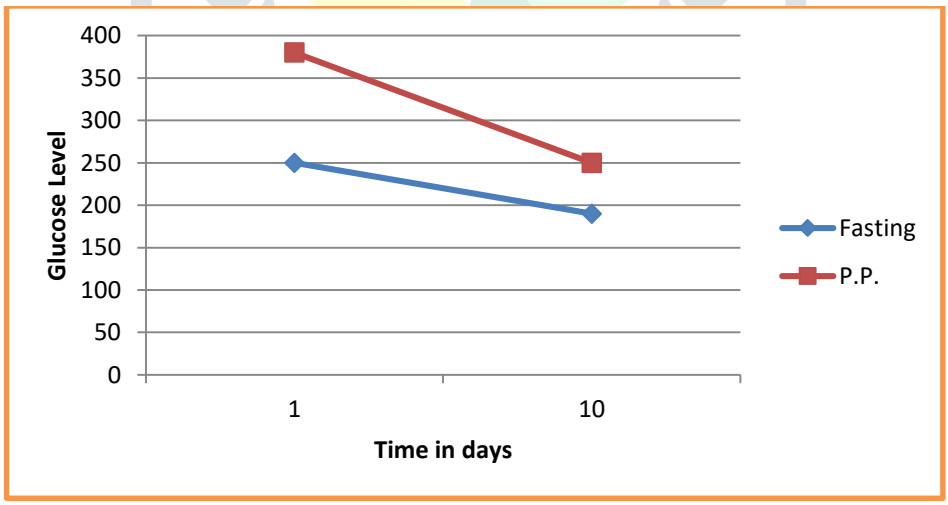


Substitute for Bitter taste:
In case study I, we have given Swietenia Macrophylla seed (Sky Fruit), but for removal of bitter taste from mouth we can use substitute i.e. Hard Gelatin capsule and Swietenia Macrophylla seeds can be filled into it.

Results obtained after filling 300, 80, and 30 mg Swietenia Macrophylla seeds in Hard Gelatin capsule (0 size). In case II, III, IV respectively.

Case II: when dose of 300 mg with capsule filled daily for 10 days
In this case we have given Swietenia Macrophylla seeds to 51 yrs old diabetic woman 300 mg capsule filled for consecutive 10 days, it is easy to intake to her because of seeds are filled in the hard gelatin capsule, so that the bitter taste of seeds did not sense by her mouth.

	Fasting Glucose Level	Post Prandial Glucose Level	Duration
Before	250.00 mg/dl	380.00 mg/dl	10days
After	190.00 mg/dl	250.00 mg/dl	



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Case III: when dose of 80 mg with capsule filled daily for 20 days
In this case we have given Swietenia Macrophylla seeds to 56 yrs old diabetic woman 80 mg capsule filled for consecutive 20 days, it is easy to intake to her because of seeds are filled in the hard gelatin capsule, so that the bitter taste of seeds did not sense by her mouth

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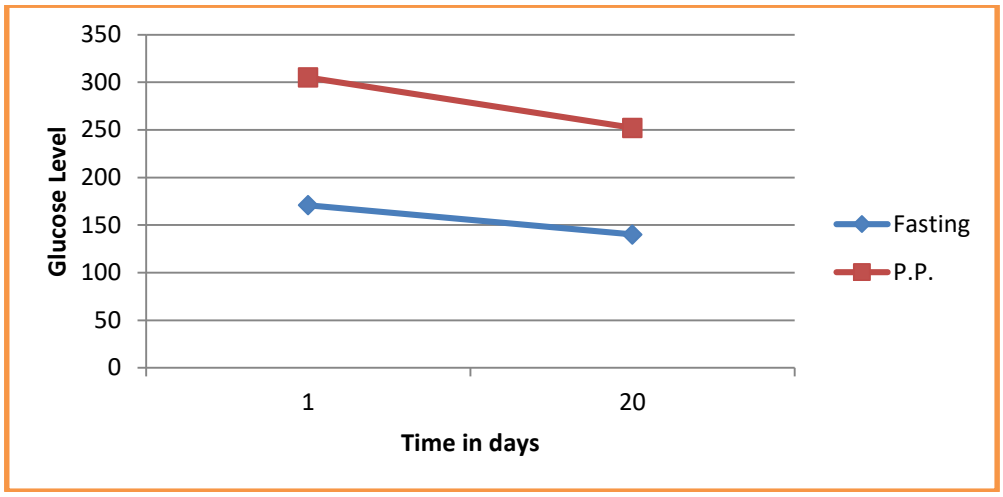
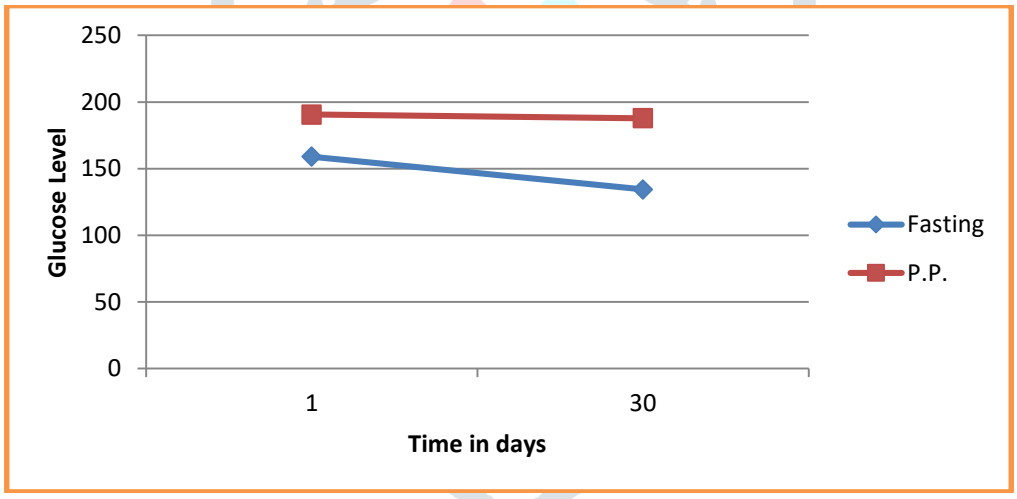
	Fasting Glucose Level	Post Prandial Glucose Level	Duration
Before	170.90 mg/dl	305.00 mg/dl	20 days
After	140.00 mg/dl	252.00 mg/dl	



Case IV: when dose of 30 mg with capsule filled daily for 30 days

In this case we have given Swietenia Macrophylla seeds to 58 yrs old diabetic woman 30 mg capsule filled for consecutive 30 days, it is easy to intake to her because of seeds are filled in the hard gelatin capsule, so that the bitter taste of seeds did not sense by her mouth.

	Fasting Glucose Level	Post Prandial Glucose Level	Duration
Before	158.99 mg/dl	190.53 mg/dl	30 days
After	134.42 mg/dl	187.80 mg/dl	



III. DISCUSSION

The antidiabetic activity of the Crude drug Swietenia macrophylla(Sky Fruit) was carried out on human in different dose, different ways and for different time duration.

In case I, we have given Swietenia Macrophylla seeds to 56 yrs old diabetic man 500 mg orally for consecutive 5 days. Before it the Fasting glucose level calculated and was equal to 168.35 mg/dl and urine sugar was present (+), And Post Prandial sugar level was 219.50 mg/dl and urine sugar was present (++). After 5 days the glucose level were changed, the fasting glucose level was 130 mg/dl and urine sugar was absent, in post prandial sugar level was 135 mg/dl and urine sugar was absent.

In case II, we have given Swietenia Macrophylla seeds to 51 yrs old diabetic woman 300 mg capsule filled for consecutive 10 days. Before it the Fasting glucose level calculated and was equal to 250 mg/dl and urine sugar was present (+), And Post Prandial sugar level was 380 mg/dl and urine sugar was present (++). After 10 days the glucose level were changed, the fasting glucose level was 190 mg/dl and urine sugar was absent, in post prandial sugar level was 250 mg/dl and urine sugar was absent.

In case III, we have given Swietenia Macrophylla seeds to 56 yrs old diabetic woman 80 mg capsule filled for consecutive 20 days. Before it the Fasting glucose level calculated and was equal to 170.9 mg/dl and urine sugar was absent, And Post Prandial sugar level was 305 mg/dl and urine sugar was present (+++). After 20 days the glucose

level were changed, the fasting glucose level was 140 mg/dl and urine sugar was absent, in post prandial sugar level was 252 mg/dl and urine sugar was absent.
In case IV, we have given Swietenia Macrophylla seeds to 58 yrs old diabetic woman 30 mg capsule filled for consecutive 30 days. Before it the Fasting glucose level calculated and was equal to 158.99 mg/dl and urine sugar was absent, And Post Prandial sugar level was 190.53 mg/dl and urine sugar was present (+). After 30 days the glucose level were changed, the fasting glucose level was 134.42 mg/dl and urine sugar was absent, in post prandial sugar level was 187.80 mg/dl and urine sugar was absent.

IV. RESULTS

From the four cases, we have calculated change in glucose level in diabetic patient,
In case I, the fasting glucose level changed in 38.5 mg/dl in 5 days and post prandial glucose level changed in 84.50 mg/dl in 5 days.
In case II, the fasting glucose level changed in 60 mg/dl in 10 days and post prandial glucose level changed in 130 mg/dl in 10 days.
In case III, the fasting glucose level changed in 30.90 mg/dl in 20 days and post prandial glucose level changed in 53.00 mg/dl in 20 days.
In case IV, the fasting glucose level changed in 24.57 mg/dl in 30 days and post prandial glucose level changed in 2.73 mg/dl in 30 days.

V. REFERENCES

1. Anup Maiti, Saikat Dewanjee, Goutam Jana, Subhash C. Mandal, “Hypoglycemic effect of *Swietenia* macrophylla seeds against type II diabetes”, International Journal of Green Pharmacy, October-December 2008.

2. Hanan Kumar G, Nur Hayati J M, N D Salih, R M Noah, Khairul Nizam M I, Muhammad Rohani J, “The Effectiveness of Hot Water and Aqueous-Methanol Extractions of Malaysian
3. Swietenia Macrophylla King Seeds and Endocarps Combined on Diabetic Rats”, International Journal of Applied Science and Technology, Vol. 4 No. 2; March 2014.

4. Hanan Kumar G, Nur Hayati J M, N D Salih, A. R. Norzein, R.M. Noah, “The Protective Effects of Swietenia Macrophylla King (Seeds& Endocarps) Aqueous-Methanolic Extract On Pancreatic Islets Histology In Streptozotocin–Induced Diabetic Rats”, International Journal of Pharmacy and Pharmaceutical Sciences, ISSN-0975-1491, Vol. 6, Issue 6, 2014, Page No. 175-179.

5. CHEONG WEI LI, “CHEMICAL CONSTITUENTS FROM METHANOL SOAKING OF Swietenia macrophylla King”, Project report, September 2016.