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Review on the Anti-Diabetic Activity of *Salacia reticulata*

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Abstract*: Diabetes mellitus has rapidly emerged as a major health problem in developed and developing countries throughout the world. Numerous factors contributing to this epidemic are related primarily to social, economic, technological and scientific advances that have resulted in increases life expectancy and marked decrease in physical activity. WHO estimates that the Diabetes was the 7th leading cause of death in 2016. In 2016, an estimated 1.6 million deaths were directly caused by Diabetes. As the death rate and the number of patients conveyed no reduction, this research was aimed to review the anti diabetic actions of an authentic medicine, Salacia reticulata as a therapeutic remedy.*

Keywords— Diabetes mellitus; *Salacia reticulata*

1. INTRODUCTION

Diabetes is a major non - communicable disease of the world throughout the last few centuries. Urbanization, Technological development, busy life schedules lead to an unhealthy human being. WHO declares that the number of people with diabetes rose from 108 million in 1980 to 422 million in 2014. The global prevalence of diabetes among adults over 18 years of age rose from 4.7% in 1980 to 8.5% in 2014. Between 2000 and 2016, there was a 5% increase in premature mortality from diabetes [1]. Salacia Reticulata is a medicinal herb from Ayurveda which appears to have anti-diabetic activities, namely by inhibiting carbohydrate uptake from the intestines [2]. Neither insulin nor other modern pharmaceuticals has been shown to modify the course of diabetic complications mainly due to the multi factorial basis that involves both genetic and environmental risk factors. Therefore, new therapeutics aimed at multiple targets have been extensively investigated. In order to meet the ever increasing demand, commercial exploitation of the species simultaneously with the scientific investigations is of paramount important. The present paper reviewed the antibacterial effect of *Salacia reticulate* [3]. The major advances in the molecular understanding of diabetes in relation to the different types of diabetes in comparison to the previous understanding in this field, and the anti diabetic effects of *Salacia reticulata* are reviewed here.

2. DIABETES MELLITUS

2.1 Classification of Diabetic mellitus

Diabetes mellitus is a severe and debilitating chronic disease that develops in nearly 5 percent of the world's population. People with this disease have a shortage of insulin or a reduced ability to use insulin, the hormone regulating blood glucose levels, which is normally produced by the pancreas [4]. Different classes of diabetes mellitus, type 1, type 2, gestational diabetes and other types of diabetes mellitus are compared in terms of diagnostic criteria, etiology and genetics [5].

2.2 Type 1 diabetes

Insulin dependent (type 1) diabetes accounts for around 10% of diabetics [4]. Type 1 DM results from an absolute deficiency in insulin caused by the failure of secretion by the pancreas, while type 2 DM is characterized by insulin resistance and relative insulin deficiency [6]. The pathogenesis of selective β-cell destruction within the islet in type 1 diabetes mellitus is difficult to follow due to marked heterogeneity of the pancreatic lesions [7]. At the onset of overt hyperglycemia, a mixture of pseudo atrophic islets with cells producing glycogen, somatostatin and pancreatic polypeptide, normal islets and islets containing both β-cells and infiltrating lymphocytes and monocytes may be seen [8]. The autoimmune destruction of pancreatic β cells leads to a deficiency of insulin secretion that leads to the metabolic derangements associated with type 1 diabetes [9].

2.3 Type 2 diabetes

Type 2 diabetes is the most common form of diabetes. The causes of type 2 diabetes are multi-factorial and include both genetic and environmental elements that affect beta-cell function and tissue (muscle, liver, adipose tissue, and pancreas) insulin sensitivity. In type 2 diabetes, either the body does not produce enough insulin or the cells ignore the insulin. It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly. As the need for insulin rises, the pancreas gradually loses its ability to produce it [10].

3. PLANT DESCRIPTION

3.1. Medicinal Properties of *Salacia reticulata*

Salacia is a genus of climbing plants of the Hippocrateaceae family and is widely distributed throughout Southeast Asia, including India, Sri Lanka, and Thailand [11]. *Salacia reticulata* is a plant widely known in Sri Lanka to be

effective for the prevention of hyperglycemia. Salacia exhibits antimicrobial, hepatoprotective, antimalarial, anti-inflammatory and anti-obese activities. Root decoction of Salacia reticulate is used for treating rheumatism, gonorrhea, hemorrhoids, skin diseases, swelling, itching, thirst, asthma, dysmenorrheal and amenorrhea [12]. The roots and stems of *S. reticulata* have been used for prevention or remedy of diabetes [13].

3.2. Morphology of *Salacia reticulata*

Salacia reticulata is a climbing, perennial, woody shrub. Bark is smooth, greenish grey in colour, thin, and white internally. Leaves: opposite and elliptic-oblong. Leaf-base is acute, apex abruptly acuminate, margin are toothed with minute rounded teeth. Flowers are bisexual and arranged as 2-8 clustered in leaf axils [12]. Flowers 2-8 on axillary tubercles or peduncles, 6-7 mm in diameter; greenish-yellow; petals 5. Fruit a drupaceous, globose, 1.6-3.8 cm diameter, pink orange when ripe, seeds 1-4 . Seeds yellow [14].

3.3. Chemical constituents of *Salacia reticulata*

Chemical constituents such as 1,3-diketones, dulcitol and leucopelargonidin, iguesterin, epicatechin, phlobatannin and glycosidal tannins, triterpenes, and 30-hydroxy-20(30) dihydroisoiguesterin, hydroxyferruginol, lambertic acid, kotalagen-in 16-acetate, 26-hydroxy-1,3-friedelanedione, maytenfolic acid have also been detected in the roots of S. reticulata [15]. Constituents that have been identified as exhibiting anti-diabetic effects include salacinol, kotalanol, ponkorinol, salaprinol, and their corresponding de-0-sulfonated compounds [16].

4. ANTI DIABETIC ACTION OF WATER EXTRACTS OF STEMS

4.1 α--Glucosidase inhibitors of *Salacia*

Stems and roots of *Salacia* contain potent □-glucosidase inhibitors (salacinol and kotalanol) and also the aldose reductase inhibitor, kotalgenin-16-acetate. Salacinol and kotalanol competitively bind to □-glucosidase present in the brush borders of small intestine and prevent the breakdown of oligosaccharides into monosaccharides and thus, maintain the normal blood levels in the human body[3].*Salacia reticulate* supplementation significantly decreased levels of HbA1c, compared with those of the control group. Histopathologically, degeneration of pancreatic islets and renal glomerular sclerosis were remarkably suppressed [17].

In vitro studies demonstrate the ability of Salacia to inhibit intestinal alpha glucosidase. In mouse mesenteric fat it enhances the mRNA expression for hormone sensitive lipase (HSL) and adiponectin; thus increasing lipolysis and reducing insulin resistance respectively. In 3 T3-L-1 adipocytes lipogenesis factors are down regulated and lipolysis factors are up regulated with *Salacia reticulata* treatment. Animal studies and clinical trials are consistent in demonstrating improvement of glucose concentrations in the fasted and sucrose and maltose loaded states [18].

hypoglycemic activity was established in the precipitate of methanol fraction in alloxan diabetic rats, and it was used for the long-term oral treatment. Chronic oral administration of the precipitate from meth- anol fraction to alloxan diabetic rats twice a day for 120 days improved glucose tolerance and significantly reduced fasting blood glucose, fructosamine, and glycosylated hemoglobin levels. The polydypsia, hyperphagia, and weight loss of the alloxan diabetic rats were also reduced by the treatment[19].

Thirty-five healthy subjects were randomly assigned to different doses of *Salacia chinensis* extract (200 mg, 300 mg, and 500 mg SCE) capsules and compared with placebo. It is a placebo controlled randomized crossover design study. Subjects were given oral sucrose solution along with capsules and plasma glucose and insulin responses were analyzed. Blood samples were collected at 0, 30, 60, 90, 120, and 180 minutes after administration. AUC insulin significantly lowered after ingestion of SCE. No significant adverse events were observed. Reducing glucose and insulin is very important in reducing postprandial hyperglycemia [19].

4.1 SALACIA RETICULATA ROOT EXTRACT ON PREGNANCY

It is recognized that some clinically used antidiabetic drugs have harmful effects on pregnancy but the effects of the S. reticulata root extract on reproductive outcome is unknown and deserves examination. We determined the effects of the S. reticulata root extract on the reproductive outcome of Wistar rats (250-260 g) when administered orally (10 g/kg) during early (days 1-7) and mid- (days 7-14) pregnancy [20]. The root extract was non-teratogenic. We conclude that the S. reticulata root extract can be hazardous to successful pregnancy in women and should not be used in pregnancy complicated by diabetes [21].

5. Discussion

Salacia Reticulata is very widely used for Diabetic treatments. Salacia reticulate is also used for treating rheumatism, gonorrhea, haemorrhoids, skin diseases, swelling, itching, thirst, asthma, dysmenorrheal and amenorrhea. In considering the therapeutic actions of Salacia Reticulata on diabetes, many researches revealed that the stem extract of Salacia reticulate inhibit the glucose absorption through inhibiting intestinal alpha glycosidase and reduce the insulin resistance. It was also effective for Obesity as it has lipid lowering actions.

6. Conclusion

In conclusion Salacia Reticulata stem extract is effective in controlling Diabetes. It has both glucose absorption inhibitory actions and Lipid lowering actions. It should be avoided in pregnancy. Further researches can be improved as clinical trials in confirming these effects.

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