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Efficacy of Herbal Remedies on Insulin Resistance and Oxidative Stress in Streptozotocin-Induced

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Abstract

Rats were used to study the antioxidant capacities of amla extracts and their impact on the oxidative stress in streptozotocin-induced diabetes. The streptozotocin-induced diabetic rats were given amla orally for 20 days in the form of either the commercial enzymatic extract Sun Amla or a polyphenol-rich fraction of ethyl acetate extract. Strong free radical scavenging action was demonstrated by amla extracts. Moreover, the formation of advanced glycosylated end products was significantly inhibited by amla. The oral administration of amla extracts to diabetic rats considerably reduced several oxidative stress markers in their serum while also somewhat improving body weight growth.

Keywords: Herbal remedies • Insulin resistance • Streptozotocin

Introduction

Rats were used to study the antioxidant capacities of amla extracts and their impact on the oxidative stress in streptozotocin-induced diabetes. The streptozotocin-induced diabetic rats were given amla orally for 20 days in the form of either the commercial enzymatic extract Sun Amla or a polyphenol-rich fraction of ethyl acetate extract. Strong free radical scavenging action was demonstrated by amla extracts. Moreover, the formation of advanced glycosylated end products was significantly inhibited by amla. The oral administration of amla extracts to diabetic rats considerably reduced several oxidative stress markers in their serum while also somewhat improving body weight growth [1].

The diabetic rats administered amla dramatically lowered the high serum levels of 5-hydroxymethylfurfural, a glycosylated protein that is a marker of oxidative stress. Similar to this, the serum level of creatinine another indicator of oxidative stress was also decreased. Moreover, amla dramatically decreased the levels of thiobarbituric acid-reactive compounds, indicating a decline in lipid peroxidation. Moreover, amla dramatically increased the reduced albumin levels in the diabetic rats. Amla also markedly increased the serum levels of adiponectin. These findings provide the evidence-base for amla's ability to reduce oxidative stress and enhance glucose metabolism in diabetics [2].

Literature Review

Several traditional plants have been employed in the treatment of serious illnesses including diabetes. These plants have antioxidant properties that have been demonstrated to reduce the complications of diabetes. Streptozotocin induction caused diabetic Wister albino rats to develop. In Streptozotocin-induced diabetic rats, the effects of ethanolic extracts of either *Syzygium cumini* seeds or *Cinnamomum zeylanicum* bark were examined. Administration of *Cinnamomum zeylanicum* bark or *Syzygium cumini* seeds had an effect, which was seen. Plasma antioxidant enzymes, blood glucose, insulin level, haemoglobin content, lipid profile, liver and kidney functions. Blood glucose, total cholesterol, triglycerides and low density lipoprotein cholesterol levels rose in diabetic rats. High density lipoprotein cholesterol and insulin levels, however, were decreased [3].

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Following oral administration of *Syzygium cumini* seeds and *Cinnamomum zeylanicum* bark, it was shown that insulin levels and HDL cholesterol increased while blood sugar levels, total cholesterol, triglycerides and LDL cholesterol decreased. Also, compared to diabetic rats that had been given treatment, the antioxidant enzymes in diabetic control rats displayed considerably aberrant levels of low superoxide dismutase, catalase, glutathione peroxide activity and reduced glutathione. In the degree of lipid peroxidation as well.

The antioxidant activity of *Syzygium cumini* seeds and *Cinnamomum zeylanicum* bark was demonstrated by increased superoxide dismutase and glutathione peroxide activities as well as a decrease in lipid peroxidation. In streptozotocin-induced diabetic rats, herbal *cinnamomum zeylanicum* bark and *syzygium cumini* work to reduce insulin levels, hyperglycemia, hyperlipidemia, oxidative stress and kidney and liver dysfunctions.

Discussion

Diabetes mellitus is linked to metabolic abnormalities like hyperglycemia, changed lipid profiles, altered protein and carbohydrate metabolisms and an elevated risk of cardiovascular disease consequences. It has an impact on more than 200 million people worldwide. Diabetes type 1 and type 2 both include hyperglycemia, microvascular and macrovascular complications. Moreover, both types of diabetes have been linked to altered lipoprotein metabolism in the aetiology of the cardiovascular disease.

Diabetes is also associated with higher levels of free radicals, which has been linked to weakened antioxidant defence. Oxidative anxiety is what leads to diabetic problems and progression. Nowadays, diabetes medicines like insulin and oral hypoglycemic drugs come with their own limitations. Several conventional medicinal herbs have been revealed to possess antioxidant properties, which may contribute in some way to their therapeutic effects.

In this work, ethanolic extracts of *Syzygium cumini* and *Cinnamomum zeylanicum* are employed. The constituents of both plant extracts that are active are listed in prior studies. Trans cinnamaldehyde is the main component of *Cinnamomum zeylanicum* bark oil and it is evaluated. Small components include trans cinnamyl acetate, eugenol, trans cinnamyl alcohol, o-methoxy benzaldehyde, benzyl benzoate, linalool, benzyl benzoate, limonene, myrcene and traces of trans cinnamic acid were quantified by gas chromatography in all Cinnamomum species.

Samples of *Syzygium cumini* seeds and *Cinnamomum zeylanicum* bark were taken from the Riyadh market. The research centre for Medicinal Aromatic and Poisonous Plants' herbarium has records of the identification of samples that were collected [4].

Cassia zeylanicum Barks and *Syzygium cumini* seeds were each cleaned individually in sterile distilled water and then running tap water. They were left to dry at room temperature for two days, pounded into a fine powder and then put into airtight containers for storage. 10 g of bark or seed powder were dissolved in 100

ml of ethanol while being shaken and the mixture was allowed to sit for 24 hours. Filtering the suspension was followed by extract concentration utilising a Rotary Evaporator System in a vacuum below 400C. The dried extract was exposed to UV light for 24 hours while being tested for sterility on nutrient agar plates. Until use, the extract was kept in sterile bottles with labels in a freezer at 40°C.

Thirty healthy adult male rats were used for the present study. Rats were caged individually under controlled standard conditions of light, temperature and humidity. They were fed with standard pellet diet and provided water ad libitum. For the purpose of stabilising blood glucose levels, diabetic rats were housed under conventional laboratory conditions for 14 days. Blood glucose levels were measured again after inducing diabetes for 14 days. For the current investigations, animals with blood glucose levels greater than 250 mg/dl were chosen [5].

For the purpose of collecting blood from the heart puncture, rats were given halothane anaesthesia. Moreover, livers were removed to track antioxidant activity. Glucose was assessed right away after blood was drawn. The remaining blood was stored as a serum and kept frozen at 20°C.

Rat insulin used as a standard for the radioimmunoassay method used to measure serum insulin. The cyanomethemoglobin method was used to estimate the haemoglobin and glycosylated haemoglobin in fresh blood. Commercial kits were used to measure the amounts of serum creatinine, urea, total protein, glutamate-pyruvate transaminase and glutamate-oxaloacetate transaminase. Semi-autoanalyzer was used to estimate all biochemical parameters [6].

Low-density lipoproteins and very low density lipoproteins precipitated with phosphotungstate and magnesium ions were used to measure cholesterol and triglycerides in the samples. The amount of cholesterol in the HDL fraction that is still in the supernatant after centrifugation is measured.

Conclusion

The effect of ethanolic extract of *Cassia zeylanicum* and *Syzygium cumini* on serum insulin levels is Streptozotocin - induced rats of diabetes had decreased level of serum insulin significantly in comparison with normal control rats, while the treatment of *Syzygium cumini* and *Cassia zeylanicum* significantly increased serum insulin levels, toward normal levels, more than diabetic control rats. Induction of diabetes considerably increased the level of HbA1c, but lowered the level of Hb when compared to normal control rats, according to the effects of ethanolic extracts of Cassia *zeylanicum* and *Syzygium cumini* on haemoglobin and HbA1c. When given to diabetic rats, *Syzygium cumini* and *Cassia zeylanicum* effectively lowered their high HbA1c levels and raised their haemoglobin levels towards normal ranges.

Acknowledgement

None.

Conflict of Interest

None.

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