ABSTRACT

The aim of the study was to find out the pharmacognostical, phytochemical and antidiabetic effects of *costus igneus* (N.E.Br.) on streptozotocin induced diabetic rats as discussed in various chapters of this thesis. In the pharmacognostical studies, the morphological, anatomical features of various plant parts of *Costus igneus* such as young root, leaf and rhizome were investigated in detail and demonstrated by illustrations. The total ash content, acid insoluble ash and water-soluble ash of rhizome were significantly (p<0.001) higher than stem and leaves. Moisture content, protein and carbohydrate levels were relatively higher in leaves. In Fluorescent analysis, leaf, stem and rhizome powders were treated with various chemicals and were studied under UV light and daylight.

Phytochemical studies revealed that the presence of constituents like tannins, flavonoids, phlobatannins, terpenoids, saponin, steroids, cardiac glycosides were confirmed. The sapogenin and flavonoids compounds had antidiabetic activity were separated using column and preparative TLC (silica gel 60 F254, n-hexane: Ethyl acetate (7:3)) at Rf 0.27. The fractions collected through column chromatography and TLC were characterized by GC-MS, NMR and FTIR. HPTLC was used for quantification of quercetin (0.794%, 0.692%) and kaempferol, (4.2%, 3.1%) in *CiREE* and *CiLEE* respectively, similarly diosgenin (0.5%, 0.34%) and betasitosterol (3.5%, 1.334%) in *SECiR* and *SECiL* respectively. Fatty acids compounds of *CiSEE*, *CiLEE* and *CiREE* were identified by GC-MS. Among the different fatty acids, n-hexadecanoic acid content was found higher in *CiSEE* (35.29%) and *CiLEE* (19.53%) than *CiREE* (12.70%).

Pharmacological study includes single dose analysis, glucose tolerance test and 30 days antidiabetic activity of *CiREE*, *SECiR* and isolated diosgenin from *Costus igneus* rhizome in streptozotocin (STZ) induced diabetic rats. For the single dose hypoglycemic analysis of the isolated diosgenin (5, 10mg/kg), *CiREE* (50, 100, 200mg/kg), *SECiR* (20, 30mg/kg), they were administrated in STZ induced diabetic rats. The blood glucose levels were determined at 0, 30, 60, 90, 120 and 180min. The result showed that after oral administration of diosgenin (5, 10mg/kg), *CiREE* (100, 200mg/kg), *SECiR* (30mg/kg) there were significant reduction in blood glucose levels (P < 0.05) on 30min in the diabetic rats and slightly reversed on after 150 min. At the dose of 200mg/kg of *CiREE* and 10mg of diosgenin the increased blood glucose levels were found reduced significantly in STZ induced diabetic rats.
Glucose tolerance test was carried out for isolated diosgenin (5 and 10mg/kg), CiREE (100 and 200mg/kg), SECiR (20 and 30mg/kg) by oral administration in STZ induced diabetic rats. Immediately after the oral administration of above mentioned extracts, a glucose solution (2gm/kg bw) was administered orally in to all groups and four blood samples were taken at 30, 60, 90 and 120min after glucose administration. The maximum glucose reduction of 32%, 27%, 23% within 150 min were found to be with administration of diosgenin (10mg/kg bw), SECiR (30mg/kg bw), CiREE (200mg/kg bw) respectively.

Antidiabetic activity of CiREE at the dose of 100, 200 mg/kg, SECiR at the dose of 20,30mg/kg, isolated diosgenin compound at the dose of 5,10mg /kg were orally administered as a single dose per day to STZ-induced diabetes rats for a period of 30 days. The effect of CiREE, SECiR and isolated diosgenin on blood glucose, plasma insulin, liver glycogen, HbA1c, serum lipid profile (TC, TG, LDL, HDL), carbohydrate metabolic enzymes such as glucokinase, glucose-6-phosphatase, and fructose-1, 6-bisphosphatase in the liver; hepatoprotective enzymes such as AST, ALT and ALP in plasma and liver; and antioxidative enzymes such as SOD, CAT, Gpx, GSH, TSH, LPO in liver, kidney and pancreas were measured and histopathological studies of pancreas were done in normal and diabetic rats. The results showed that gluconeogenic enzymes (glucose-6-phosphatase and fructose-1, 6-bisphosphatase), AST, ALT, ALP, LPO, LDL, total cholesterol, triglyceride, urea, uric acid were found to be significantly (p<0.05) increased, whereas glycolytic enzyme glucokinase, SOD, CAT, Gpx TSH, HDL, total protein, albumin and globulin levels were significantly (p<0.05) decreased in the diabetic rats.

Oral administration of CiREE, SECiR, isolated diosgenin and reference drug (commercial diosgenin and glibenclamide) to diabetic rats for 30 days significantly (P<0.05) reversed their values to normal. In diabetic rats, the destruction of the liver, kidney and pancreas architectures, cytoplasmic vacuolation, nuclei of many cells revealed clear signs of necrosis, leucocytic infiltration, fibrosis, inflammation in central vein and blood vessels, the portal veins appeared congested with blood with fibrosis and reverse back to normal architectures of liver, kidney and pancreas after treatment with CiREE, SECiR and isolated diosgenin.

In conclusion Costus igneus extract could influence protein, lipid metabolism and marker enzymes in STZ-induced diabetic rats. This effect may be due to the presence of steroidal sapogenin such as diosgenin, betasitosterol, and flavonoids such as quercetin,
kaempferol and other constituent presence in the rhizome. The mode of action for these extracts and isolated compounds on control of diabetes are a challenging problem need to be addressed in future studies. Further it is concluded that the extracts of *Costus igneus* (*CiREE, SECiR*) and isolated diosgenin were found enhanced the activity of glucokinase (glycolytic enzyme), glycogenin storage in liver and control the levels of glucose-6-phosphatase and fructose-1, 6-bisphosphatase (gluconeogenic enzymes) in STZ-induced diabetic rats.