EFFECT OF COCCINIA INDICA (L.) AND ABROMA AUGUSTA (L.) ON GLYCEMIA, LIPID PROFILE AND ON INDICATORS OF END-ORGAN DAMAGE IN STREPTOZOTOCIN INDUCED DIABETIC RATS.

M. Halim Eshrat
National Chemical Laboratory, Pune-411008

ABSTRACT

In Ayurvedic system of medicine in India, not only extracts of one plant or the other but also a combination of plant extracts are used for the treatment of diabetes mellitus. The present paper reports the combined effect of Abroma augusta and Coccinia indica known to be useful for the treatment of diabetes in Ayurveda on the fasting blood sugar, glucose tolerance and lipid profile of Streptozotocin (STZ) induced albino rats. 300mg of water extract of the mixture of dried powdered roots of A. augusta and leaves of C. indica in equal proportions was given once daily for 8 weeks. After 8 weeks of treatment of Streptozotocin (STZ) diabetic rats, the fasting blood sugar came down to almost normal value and improvement in glucose tolerance and serum lipid profile were also observed.

KEY WORDS

Hypoglycaemic plants; Abroma augusta, Coccinia indica; Streptozotocin (STZ), diabetes neuropathy.

INTRODUCTION

Diabetes is prevalent world wide and is stated to be one of the important causes of death world wide. Diabetes mellitus (DM) is a metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion insulin action or both (1). The risk of diabetic complications, particularly cardiovascular diseases (CVD) peripheral vascular disease (PVD) (2). Complications such as coronary artery disease (CAD), stroke, neuropathy, renal failure, retinopathy, amputations, and blindness etc are known to be associated with DM (3). Insulin and various types of hypoglycemic agents such as biguanides and sulfonylureas including some of the recently developed ones are available for the treatment of diabetes. But none are ideal in treatment due to the toxic side effects and some times diminution in responses after prolonged use (3-4). The disadvantages of the presently available drugs are that they have to be given throughout the life and produce side effects (4). A variety of plant preparations have been mentioned in Ayurveda and other indigenous systems of medicine, which are claimed to be useful in treatment of diabetes mellitus. (5). World Health Organization (WHO) has suggested the evaluation of the potential of plants as effective therapeutic agents, especially in areas where we lack safe modern drugs (6). In the ongoing search for more effective and safer drugs attention is being paid to new and safe drugs (6-8). There are many studies on A. augusta which show that it exhibits antifertility effect (9). Petroleum ether extract was found to contain antifertility agents (9). Some of the plants useful for the treatment of diabetes mellitus including those from which some active constituents were isolated have been recently reviewed by Shukla et. al (10). Reported that Abroma augusta possesses not only antihyperglycemic but also hypolipidemic effect (11-12-13). Coccinia indica is also known to be a drug useful for the treatment of diabetes mellitus (14). In this paper the combined effect of water extract of a mixture Abroma augusta roots and Coccinia indica leaves in streptozotocin induced diabetic in rats is reported.

MATERIAL AND METHODS

Abroma augusta was collected from Khasia mountains in Assam and its was identified from Botanical Reseach Institute Lucknow, India.
Coccinia indica was obtained from Indian Agricultural Research Institute, Delhi. The roots of A. augusta and C. indica leaves were air dried and powdered in a grinder and mixed in equal proportions.

Preparation of water extract:

150 gm of Powder mixture of the two plant parts was extracted overnight with 180 ml of water with magnetic stirring in cold room (4°C). The water extract was separated and the residue was re-extracted with water. The combined water extract was concentrated in lyophilizer.

Animals

Wistar albino rats were obtained from Centre for Cellular and Molecular Biology, Hyderabad clearance is taken from animal ethics committee (IEC). Adult rats of either sex weighing between 100-200 gms were selected for the study. The animals were acclimatized to laboratory conditions and divided into various groups. Animals were housed and kept on the light and dark cycle through out.

Induction of diabetes and associated neuropathy

Healthy adult albino wistar rats of both sexes weighing between 100-200 gm were obtained from the Centre for Cellular and Molecular Biology (CCMB), Hyderabad and used in this study. The animals were fed on a pellet diet (Hindistan Lever, India) and water provided ad libitum. Diabetes was experimentally induced to produce diabetic neuropathy (12-13). Sorbitol induced dysfunction of inositol / metabolites leading to neuro-infarction. By causing microangiopathy of vasa nervosum it decreases blood flow to nerves. Over night fasting animals were injected with streptozotocin (STZ) (60 mg / kg dissolved in 3 mM citrate buffer (pH 4.5) intraperitoneally (i. p). After 10 days only those rats which showed plasma glucose levels > 300 mg/dl were classified as diabetic and were included in study as described earlier by our laboratory (14). Animals were divided into three groups of five each. Group 1 animals served as healthy controls, while those of the group 2 were untreated diabetic rats. Rats of group 3 were diabetic treated for 8 weeks with 300 mg of water extract of A. augusta plus Coccinia indica. (13 - 14). Blood samples were collected from overnight fasted rats at 0 and 8 weeks. Blood glucose serum total cholesterol, HDL and LDL- cholesterol, triacylglycerol, and Glycosylated hemoglobin were determined using kits from Randox Mumbai. Total proteins albumin and creatinine in serum were determined by the method of Reinhold (15). Assay of plasma glucose and albumin and creatinine and total cholesterol, LDL-VLDL & HDL cholesterol and triglycerides were estimated as described earlier (12-16-17). Lipid peroxidation products were estimated as thiorbituric acid reactive substance (TBARS) in plasma & tissues (16-17).

Statistical analysis:

All the data were statistically evaluated and the significance calculated using student's test. All the results were expressed as mean ± SD.

RESULTS AND DISCUSSION

The results obtained with untreated diabetic rats and diabetic rats treated with A. augusta plus C. indica on fasting blood glucose and GTT are compared with normal healthy controls and shown in (Tables 1 and 1A). It is seen that treatment with water extract of A. augusta plus C.indica at a dose of 300mg / kg body wt brought down fasting blood glucose (Table1), from a higher value of 166.9 ±25.4 mg/dl to a normal value of 85.4±2.3 mg/dl while in the untreated group the FBG increased from the initial value of 172.2 ±5.4 to 285.6±42.6 mg/dl. There was considerable fall in FBG in diabetic rats treated with A. augusta alone or C. indica alone. The effect was more with C. indica. But the effect of the two plants in combination was more than that with either of the plants alone. Similar improvement to normal glucose tolerance was seen in GTT also (Table 1B). In the diabetic untreated rats the blood sugar was 269.0 ±92.2 mg/dl even after 2 hrs of glucose load in GTT. But in the A. augusta plus C. indica treated rats the 2 hr blood glucose value was in the normal range of 75.2±1.0 mg/dl. The fasting (0hr) blood glucose values which were higher in the diabetic animals (160.5 ±32.1) were brought down to 81.0 ±3.5mg/dl, when 300 mg of the extract of the mixture of the two plants was administered for 8 weeks. There was improvement in glucose tolerance in diabetic rats treated alone with either of the plants. The exact mechanism of action of the plant extracts either alone or in combination cannot be stated. However it is possible that these extracts increase blood insulin levels and also stimulate utilization of glucose by liver and extrahepatic tissues. The changes in the lipid profile have also been studied.