ANTI-DIABETIC ACTIVITY OF METHANOLIC EXTRACT OF *DICTYOPTERIS AUSTRALIS* (SONDER) ASKENASY COLLECTED FROM PAMBAN COAST, TAMIL NADU, INDIA

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Abstract: The present study was indented to screen the anti-diabetic activity of *Dictyopteris australis* (Sonder) Askenasy collected from Pamban coast, Ramanathapuram District, Tamil Nadu, India. The methanolic extract of *Dictyopteris australis* (Sonder) Askenasy was given via interperitoneal injection at a dose of 200 and 400 mg/kg on alloxan induced Wistar albino rats. The fasting blood glucose level, body weight and the glucose level after treatment of diabetic rats were measured. The animals treated with 200mg/kg methanolic extract were shown the best result of decrease in blood glucose level at a regular interval when the time increased up to 7 hr as compared to the dose of 400mg/kg methanolic extract treated animals. The result of the present study expressed that the anti-diabetic activity of the methanolic extract was dose dependent.
Keywords: Anti-diabetic, *Dictyopters australis*, methanolic extract, Wistar albino rats.

I. INTRODUCTION

Diabetes mellitus is a metabolic disorder in which the body does not produce or properly utilize insulin. The underlying process attributed to hyperglycemia ultimately result in oxidative stress, alteration in enzyme activity, protein glycosylation and several structural changes (Akpan *et al*., 2007). In spite of the presence of series of known anti-diabetic medicine in the pharmaceutical market, remedies from medicinal plants are used with success to treat this disease. Many marine source treatments for diabetes are used throughout the world and there is an increasing demand from patients to use the natural products with anti-diabetic activity (Iwai, 2008). In recent years an increasing number of novel compounds have been isolated from marine algae and many have been reported to posses different biological activities (Gamal, 2012). Brown seaweeds are the only known non-animals sources of thyroid hormones most seaweeds are rich in vitamins, especially the B Vitamins, including B_{12}, Fucoidans, Polysaccharides containing substantial percentages of L-Fucose and Sulfate ester groups, are constituents of brown algae that have numerous other biological properties (Wang *et al.,* 2010). Hence the present study was carried out to find whether seaweeds had anti-diabetic activity of *Dictyopteris australis* (Sonder) Askenasy. The effect of the methanol extract of *Dictyopteris australis* (Sonder) Askenasy with dose of 200 and 400 mg/Kg body weight was investigated by evaluating anti-diabetic property in alloxan induced diabetic rats.

II. MATERIALS AND METHODS

2.1. Collection of Plant Sample

Dictyopteris australis (Sonder) Askenasy is brown seaweed belonging to Phaeophyceae member showed much consideration in the present study for anti-diabetic activity. *Dictyopteris australis* (Sonder) Askenasy was collected from Pamban, Ramanathapuram district, Tamil Nadu, India. The collected plant samples were rinsed with marine water to remove debris and epiphytes. The entire epiphytes were removed using soft brush. The plants were brought to the laboratory. In the laboratory, the plants were once again washed in freshwater and stored in refrigerator for further analysis (Iniya Udhaya and John Peter Paul, 2015).

2.2. Preparation of methanol extract

For the preparation of methanol extract of *Dictyopteris australis* (Sonder) Askenasy, the collected plant specimens were washed thoroughly and placed on blotting paper and spread out at room temperature in the shade condition for drying. The shade dried samples were grounded to fine powder using a tissue blender. The powdered samples were then stored in the refrigerator for further use. 30g powdered sample was packed in Soxhlet apparatus and extracted with methanol for 8h separately. The excess amount of methanol was evaporated and fine methanol crude powder was prepared and stored in the refrigerator for the Anti-diabetic activity (John Peter Paul and Yuvaraj, 2013).

2.3. Experimental Animals

Wistar albino rats (160-200g) of either sex were procured from Venkateswara Enterprises, Bangalore, Karnataka, India. The selected animals were acclimatized for 7 days under standard husbandry conditions, i.e. room temperature 35±1°C, relative humidity 45-55% and light/dark cycle 12/12h. Animals were provided with standard rodent pellet diet and had free excess to water. The composition of diet is 10% protein, 4% *Arachis* oil, 1% fibers, 1% calcium, 1000 IU/gm vitamin A and 500 IU/gm vitamin D. All the animals were acclimatized to the laboratory conditions prior to experimentation. All the experiments were conduct between 10.00 and 17.00h and were in accordance with the ethical guidelines of the International Association for Study of Pain (Zimmerman, 1983). All experiments were carried out according to the guidelines for care and use of experimental animals and approved by Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA).

2.4. Acute toxicity test

Acute oral toxicity study was performed as per OECD-423 guidelines (Ecobichon, 1997). Wistar albino rats (n=6) of either sex selected through random sampling technique was used for acute toxicity study. The animals were kept fasting for overnight providing only water, after which the extract (50% methanolic extract) was administered orally at the dose level of 5mg/kg body weight by gastric intubation and observed for 14 days. If mortality is observed in 2 out of 3 animals, then the dose administered would be assigned as toxic dose. If mortality is observed in 1 animal, then the same dose would be repeated again to confirm the toxic dose. If mortality is not observed, the procedure would be repeated for further higher doses such as 50, 300 and 2000mg/kg body weight. According to the results of acute toxicity test, the doses were chosen for experiments.

2.5. Induction of diabetes and experimental design

Prior to the beginning of the experiment all the animals were not allowed for food for 18 hours but water was allowed without stoppage. Wistar albino rats received alloxan (150mg/kg), freshly prepared in 0.1M cold citrate buffer (pH 4.5). Normal control rats received citrate buffer only. 48 hrs after alloxan administration, blood samples were collected from retro orbital plexus and plasma glucose was determined. The induction of *Diabetes mellitus* was confirmed by determination of plasma glucose level (≥250mg/dl). Diabetic rats were kept untreated for four weeks. At the end of 4th week, plasma glucose of diabetic rats ≥250mg/dl was selected for anti-diabetic studies (John Peter Paul and Iniya Udhaya, 2017).

2.6. Study design

Wistar albino rats were randomly grouped into 5 groups (6 rats/group) and received the following treatment for 4 weeks. Group 1: Normal control which received normal saline (1ml/100g/day); Group II were alloxan induced diabetic rats, groups III and IV were alloxan induced diabetic rats administered with Glibenclamide (0.60mg/kg), methanol extracts 200mg/kg and 400mg/kg respectively. During the treatment, blood was collected from retro orbital plexus at every week interval and used for determination of blood glucose level. At the end of 4th week, before the sacrifice, blood was collected from retro orbital plexus for the measurement of glucose level (Iniya Udhaya *et al.*, 2016).

III. RESULT AND DISCUSSION

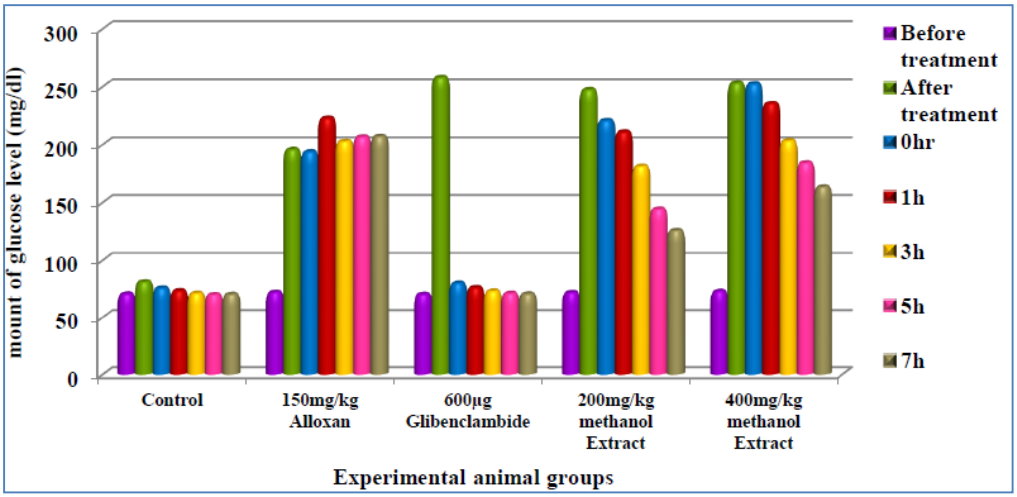
The present study was undertaken to screen the alloxan induced anti-diabetic activity of methanolic extract of *Dictyopteris australis* (Sonder) Askenasy using Wistar albino rats. The methanolic extract at the dose level of 200 and 400mg/kg body weight were injected to the treated group and Glibenclamide at the dose level of 600µg/kg was administered to the standard group. The blood glucose levels were observed after 48h induction of alloxan.

Table-1 and Figure-1 illustrated the effect of *Dictyopteris australis* on blood sugar levels of alloxan induced diabetes in rats. Administration of alloxan (150mg/kg) produced diabetes in the rats which was confirmed by the elevation of blood sugar levels. The diabetic animals were treated with methanolic extract of *Dictyopteris australis* and glibenclamide by oral administration. After 48 hr, the mean blood sugar levels were measured during the test drug administration on 0h, 1h, 3h, 5h and 7h. In the groups treated with 200mg/kg methanol extract of *Dictyopteris australis* (Sonder) Askenasy, there was a significant decrease in blood sugar levels to 220mg/dl in 0 h, 210mg/dl in 1h, 181mg/dl in 3h, 144mg/dl in 5h and 125mg/dl in 7h. The diabetic animals treated with 400mg/kg methanol extract showed the decreased blood glucose level of 252mg/dl, 235mg/dl, 203mg/dl, 184mg/dl and 163mg/dl within 0h, 1h, 3h, 5h and 7h respectively. From the present study, it was found that 200mg/kg methanol extract of *Dictyopteris australis* (Sonder) Askenasy showed the highest degree of anti-diabetic effect compared to 400mg/kg methanol extract.

Table-1: Anti-diabetic activity of methanolic extract of *Dictyopteris australis* (Sonder) Askenasy

Animal groups	Blood glucose level		Blood glucose level after drug administration in hours (mg/dl)				
	Before treatment	After 48h. of treatment	0	1	3	5	7
Control	70.5±1.1	81.0±5.2	75±5.8	73±3.3	71±0.7	70±1.4	70±1.0
Alloxan 150mg/kg	72±0.7	195±60.8	193±6	222±7	202±6	206±6	207±6
Glibenclamide	70.2±1.0	258±31.5	79±1.4	76±1.8	73±1.8	71±1.0	70±1.1
200 Methanol extract	71.7±0.8	247±8.2	220±2	210±2	181±2	144±2	125±1
400 Methanol extract	72.7±0.8	253±12.6	252±3	235±3	203±2	184±3	163±3

Figure-1: Anti-diabetic activity of methanolic extract of *Dictyopteris australis* (Sonder) Askenasy



IV. CONCLUSION

From the results obtained, it can be concluded that the methanol extract of *Dictyopteris australis* possess significant anti-diabetic property. Among the two concentrations of methanolic extract studied, 200mg/kg methanolic extract had the highest effect than 400mg/kg. This may prove helpful for developing new drugs from this plant for managing diabetes and associated complications. However further studies required to elucidate the exact mechanism of action and the structure of the secondary metabolites which is responsible for anti-diabetic activity for the development as potent anti-diabetic drug.

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