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BIOCHEMICAL ALTERATIONS DUE TO AQUEOUS EXTRACT OF *TINOSPORA CORDIFOLIA* ON ALBINO RATS.

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ABSTRACT

Medicinal plants are staging a comeback and herbal renaissance all over the globe. Global estimates indicate that 80% of about four billion population cannot afford the products of the western pharmaceutical industry and have to rely upon the use of traditional medicines which are mainly derived from plant material. The present study is therefore designed to investigate the alterations in biochemical indices i.e. glycogen and protein content due to aqueous extract of *Tinospora cordifolia* at a dose level of 300mg/kg b.wt in normal rats of Wistar strain. The study was carried out by single and daily administration of dose for 7, 14, 21 and 28 days of duration. The results revealed significant alterations due to administration of aqueous extract of *Tinospora cordifolia* in glycogen as well as protein contents in liver due to chronic administration of the dose at the duration of 21 and 28 days.

KEYWORDS: *Tinospora cordifolia,* Aqueous extract, Glycogen, Protein.

INTRODUCTION

Nature has been a source of medicinal agents for thousands of years and a large number of modern drugs have been isolated from natural resources. The use of plants as medicines goes back to early man. From the beginning of human existence, people have been searching for plants useful in a prevention and treatment of various diseases. Medicinal plants being as an important natural resource and potentially safe drugs can play an important role in assuaging human health by contributing herbal medicines. In all parts of the world, indigenous people

discovered and developed the medicinal uses of native plants, but it is from the herbal medicine of ancient Greece that the foundations of western medicine were established. Western medicine can be traced back to the Greek physician Hippocrates (460-377 BC), known as the "Father of medicine" who believed that a disease had a natural cause and used various herbal medicines in his treatments.

Tinospora cordifolia (Guduchi) is a climbing shrub belonging to the family "Menispermaceae" and is widely distributed throughout Indian subcontinent and China.[1] The stem of *Tinospora cordifolia* is rather succulent with long filiform fleshy aerial roots from the branches. The bark is creamy white to grey, deeply left spirally, the space in between being spotted with large rossette like lenticels.[2] *Tinospora cordifolia*, being a rasayana drug from Ayurveda is widely used in Ayurvedic system of medicine for its general tonic, anti-inflammatory, antiarthritic, antiallergic, antimalarial, antidiabetic and aphrodisiac properties.[3] A variety of constituents have been isolated from *Tinospora cordifolia* which belong to different classes such as alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides.[4] The stem of *Tinospora cordifolia* is one of the constituents of the several Ayurvedic preparations used in general debility, dyspepsia, fever and urinary diseases. The effect of aqueous extract of *Tinospora cordifolia* on alloxan induced hyperglycemic rats and rabbits caused reduction of blood sugar level at a dose level of 400mg/kg body weight and their histological studies on pancreas did not reveal any evidence of regeneration of β cells of islets of Langerhans.[5] The aqueous, alcoholic and chloroform extracts of the leaves of *Tinospora cordifolia* at the doses of 50, 100, 200mg/kg body weight to normal and alloxan-diabetic induced rabbits exerted significant hypoglycemic effect.[6]

MATERIAL AND METHODS

Plant Material

The coarse powder of the stem of the plant was purchased from Central Drug Research Institute (CDRI), Lucknow and it was extracted with the help of "infusion" process and the crude drug was prepared by keeping it on the heating plate. The dose concentration of 300mg/kg b.wt was used.

Animal

The study was conducted in sexually mature, male albino rats of Wistar strain (200±10gm), purchased from DRDE (Defense Research Development Establishment) Gwalior. Prior to

study, the ethical clearance was obtained from the animal Ethical Committee (CPCSEA, MOEF, Government of India) Proposal no. BU/Pharm/IAEC/11/045. The animals were housed in animal house having standard conditions, at a temperature of 25^0 to 30^0C. They were fed with rat pelleted diet and water *ad-libtum*.

Statistical Analysis

The results obtained were expressed as Mean±S.E. Significance of differences compared to the Control groups was determined using Students t- test.

Experimental protocol

The animals were divided into two groups, one served as experimental which received single and daily oral dose of *Tinospora cordifolia* at concentration of 300mg/kg b.wt and the second group act as control which received vehicle only for the interval of 7, 14, 21 and 28 days. After treatment period anesthesia was given to both groups and autopsy was done i.e. liver, kidney, uterus and ovary were collected, then biochemical parameters were studied i.e. glycogen and protein content.

RESULTS AND DISCUSSION

In the present study, effect of aqueous extract of *Tinospora cordifolia* at a dose 300mg/kg was studied on different biochemical parameters after 7, 14, 21 and 28 days of duration in various organs viz; liver, kidney, uterus and ovary of albino rats with respect to the control group. During single administration of the dose the glycogen content in liver, kidney, uterus and ovary significantly decreased at shorter duration but at longer duration it recouped to the normal as compared to the control group, while during daily administration the glycogen content decreased both at shorter and longer durations (Table 1). It may be due to the presence of various alkaloids.[7] This depletion of glycogen in the liver and other tissue is possibly due to either stimulation of insulin release from β cells or due to insulinomimetic of some component of the fruit of *Tinospora cordifolia* resulting in direct peripheral glucose uptake or due to combination of *Tinospora cordifolia* and *Eugenia jambolena*.[8] Glycogen content markedly depleted[9] which may be due to inadequate insulin secretion which results in the inactivation of glycogen synthesis.[10] Because insulin is a potent activator of the enzyme glycogen synthetase while inhibiting the enzyme glycogen phosphorylase responsible for glycogenolysis in liver and muscles.

Tinospora cordifolia when administered to albino rats at a dose of 300mg/kg b.wt for duration 7, 14, 21 and 28 days affects protein content in various organs of the rat. It was found that during single administration of the dose the protein content in liver, kidney, uterus and ovary significantly increases at shorter duration but at longer duration it recouped to the normal as compared to the control group. While during daily administration of the dose, the protein content significantly ($p<0.05$) increases both at shorter as well as longer durations (Table 2). The *Tinospora cordifolia* extract elevates GSH (glutathione) which protects cellular proteins against oxidation (via redox GSH cycle) and also directly detoxifies reactive oxygen species and neutralizes reactive intermediate species generated from exposure to xenobiotics including chemical carcinogens.[11] The plants act as mild antioxidant due to the presence of flavonoids, phenolic compounds and tannins. Since glycosylation of proteins is an oxidation reaction, due to the antioxidant activity of the plant it should be able to prevent this reaction that means the plant is having the capacity to increase the protein content of albino rats.[12] Similarly doses of *Ageratum conyzoides* (goat weed) significantly increased the level of total protein in rats i.e. plant may pose any toxicological threat to the liver when used in traditional medicine at the doses investigated.[13]

Table1: Effect of Single and daily administration of aqueous extract of *Tinospora cordifolia* on Glycogen content of Wistar rats.

S.No	Dose 300mg/kgb.wt	Experimental Duration					
			Control	7 Days	14 Days	21 Days	28 Days
1.	Liver	Acute	2585±30.4	2415±33.2*	2468±23.8	2490±34.0	2510±24.9
		Chronic	2681±35.3	2401±32.9	2310±21.4*	2231±40.1*	2141±32.9*
2.	Kidney	Acute	25.4±0.8	20.5±0.4	21.3±0.4	24.0±0.6	24.8±0.7
		Chronic	24.8±0.7	19.5±0.7	16.3±0.6*	13.2±0.4*	11.1±0.3*
3.	Uterus	Acute	18.8±0.7	14.6±0.8	15.2±0.9	17.1±0.8	18.2±0.4
		Chronic	18.0±0.7	13.2±0.7	11.4±0.8*	10.8±0.7*	10.1±0.5*
4.	Ovary	Acute	22.4±0.7	17.2±0.5	18.8±0.7	20.3±0.6	21.9±0.5
		Chronic	21.2±0.6	16.6±0.7	15.1±0.7*	14.2±0.8*	12.0±0.4*

Values are given as Mean±S.E of six animals.

Table2: Effect of single and daily administration of aqueous extract of *Tinospora cordifolia* on Protein content of Wistar rats.

S.No	Dose 300mg/kgb.wt	Experimental Duration					
			Control	7 Days	14 Days	21 Days	28 Days
1.	Liver	Acute	42.1±0.9	46.7±0.9	44.9±0.7	43.7±0.7	41.7±0.5
		Chronic	41.3±1.3	48.9±1.2	52.3±0.8*	55.4±0.8*	59.2±0.7*
2.	Kidney	Acute	21.6±0.9	27.4±0.5	25.6±0.5	23.4±0.6	21.9±0.5
		Chronic	22.3±0.9	31.2±0.5	34.3±0.6*	36.8±0.9*	39.3±0.7*

3.	**Uterus**	**Acute**	18.3±0.9	24.4±1.0	23.1±0.7	21.5±0.7	19.8±0.9
		Chronic	20.8±0.9	28.6±0.8	31.7±0.6	36.1±0.8*	39.4±0.6*
4.	**Ovary**	**Acute**	15.2±0.6	19.8±0.9	17.2±0.7	16.4±0.9	15.7±0.7
		Chronic	16.1±0.8	20.7±0.8	23.1±0.5	25.6±0.8*	29.5±0.9*

Values are given as Mean±S.E of six animals.

CONCLUSION

Therefore on the basis of present study it was found that glycogen content had decreased due to the treatment of *Tinospora cordifolia* at a dose level of 300mg/kg b.wt. However protein content was found to be increased. Thus at normal therapeutic doses *Tinospora cordifolia* is considered to be safe for the treatment in liver problems. Also some other biochemical as well as histopathological studies will also help to study the exact procedure and action of the plant extract. By phytochemical isolation, it could also be further studied to identify any active principle found in the crude extract.

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