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Effect of Aqueous Extract of *Senna siamea* (Cassia Leaves) on the Liver and Kidney of Albino Rats

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ABSTRACT

Medicinal plants have been a source of succour in the control of many diseases in developing countries. The toxic effects of an aqueous extract of *Senna siamea* were studied in 20 male albino rats' liver and kidney over a period of 7 days. The rats were divided into four groups of five rats per group. Those in Group A served as controls while the rats in Groups B, C and D were dosed *with* 100 mg/kg of the extract for different number of days. The results of this study reveals a drastic reduction ($P<0.05$) in the activities of Alkaline Phosphatase (ALP), Aspartate Transaminase (AST) and Alanine Transaminase (ALT) in the liver with a corresponding increase in the serum levels, indicating a mild liver damage which returned to normal when the administration of the extract was stopped. There was a significant increase in the activities ($P<0.05$) of AST and ALT in the kidney and the serum which might be caused by activation of enzymes synthesis in renal cells. However the reduction of ALP in the kidney and increase in the serum indicated tissue damage. The test results also revealed hypoglycaemic properties of the extract. The results obtained shows that prolonged usage of the aqueous extract of *Senna siamea* may lead to cell destruction.

INTRODUCTION

A medicinal plant is one whose one or more organs contains substances that can be used for therapeutic purpose or which are precursors for the synthesis of useful drugs [1]. The practice of traditional medicine using medicinal plants is as old as the origin of man. This type of health care was described as Herbalism or Botanical medicine [2]. Two-third of the world population (Mainly in the developing countries) rely entirely on such traditional medical therapies as their primary form of health care [3]. A review reiterated that the use of traditional medicine cannot fade out in the treatment and management of an array of diseases in the African continent. This was attributed to our socio-cultural, socio-economic heritage, lack of basic health care and personnel to take charge of every nook and cranny of our rural populations [4].

According to the World Health Organization (WHO), approximately 80% of the world's population currently uses herbal medicines in healing different ailments. Among the estimated 400,000 plant species, only 6% have been studied for biological activity, and about 15% have been investigated phytochemically [5, 6]. This shows a need for planned activity guiding phyto-pharmacological evaluation of herbal drugs.

Senna siamea is an evergreen tree that is native to south Asia. It forms part of the wet and warm tropical forests. The species have been introduced in Africa and America [7]. It is effective in managing constipation associated with a number of causes including surgery, childbirth and use of narcotic pain relievers. A study in the medicinal journal ' diseases of colon and rectum' showed that *Senna siamea* was able to prevent or treat post operation constipation after proctologic surgery[8], it is considered to be one of the more effective agents for relieving constipation caused by narcotic pain relievers such as morphine [8]. *Senna siamea* is used as antimalarial drug especially when leaves bark and shoot is decocted along with some other plant species. [9]. *Senna* species are used as the primary ingredient in certain commercial stimulant laxatives. It is also the primary ingredient found in most "dieter's tea". [10].

In the limelight of the above information the present study was undertaken to evaluate the effects of aqueous extract of *Senna siamea* in the liver and kidney enzymes and also on the blood glucose and protein levels of Wistar rats.

MATERIALS AND METHODS

Plant materials

The leaves of *Senna siamea* were collected from University of Ado Ekiti horticultural garden. They were identified and

authenticated at the herbarium of Plant Science and Forestry department, University of Ado Ekiti, Nigeria. The leaves were cleaned and air dried and grounded into a powdery fine texture.

Animal grouping

Twenty albino rats weighing between 100-200g were obtained from the Veterinary Physiology department of the University of Ilorin, Kwara State, Nigeria. They were divided into four groups (5 animals per group) they were housed in clean cages and maintained under standard laboratory conditions (temperature 25 ± 2ºC with dark/light cycle 12/12 h). They were fed with standard pellet diet (Top feed, Nigeria) and water *ad libitum*. The animals were acclimatized to laboratory conditions for one week prior to experiment. All experimental procedures were in accordance with the Institutions Animal Ethics. Rats in group one serve as untreated control while group 2-4 received different doses of the extract.

Administration of Extract

10g of the powdered leaves of cassia leaves was dissolved in 100ml of distilled water and was administered orally to the rats at a dose of 100mg/kg body weight. Rats in group 2 were given only a dose and they were sacrificed after 24hrs. Rats in group 3 received two doses and were sacrificed 24hrs after the last dose. Rats in group 4 received three doses and were left for another 4days before they were sacrificed.

Preparation of Tissue Homogenates

The rats were sacrificed by cervical dislocation and the blood was collected into a clean beaker and serum was prepared as described [11]. The rats were dissected and the liver and kidney was removed into 0.25M ice cold sucrose solution. The organs were cut into tiny pieces and homogenised in 0.25m ice cold sucrose solution in ratio 1:5w/v. The homogenates were kept frozen overnight prior to enzyme assay.

Enzyme substrate

Sodium salts of pyruvic acid, α-ketoglutarate and P-nitrophenol or orthophosphate were products of Randox Laboratories (Ltd), Atim, U.K and British Drug house limited, Poole, U.K respectively. All other reagents used were of analytical grade and were prepared in volumetric flasks.

Determination of Enzyme activities, protein and glucose concentrations

Spectrophotometric methods of Kings [12] were used to measure the activities of alanine and aspartate transaminases while alkaline phosphatase activity was determined by measuring the p-nitrophenyl phosphate at 400nm [13]. Protein concentration was measured by biuret method [14] while glucose concentration was determined by glucose oxidase method [15].

RESULTS AND DISCUSSION

The effect of the administration of the aqueous extract of cassia leaves on the activities of alkaline phosphatise is as shown in table 1. A drastic reduction was noticed in the activity of the enzyme both in the liver and kidney with a corresponding increase in the serum when compared with the control values ($P<0.05$) which may be an indication of the activation of enzyme synthesis in the tissues [16]. However, comparing group D values with that of the control, there was no significant difference which suggests that the tissues have a self repairing mechanism which is employed when the presence of a chemical or toxin is withdrawn [17].

Table 2 and 3 however shows the effect of the extract on Aspartate and Alanine Transaminase in the liver, Kidney and serum. AST measurement is diagnostically used to detect hepatocellular disease or inflammation. Increase in AST levels may indicate myocardial infarction, hepatic necrosis or drug induced liver injury and so on [18]. A drastic increase which was

Table No.1: Alkaline phosphatase activities (U/l) on administration of aqueous extract of cassia leaves in albino rat tissues

Groups	Days of sacrifice	Serum	Liver	Kidney
A	0	32.08 ± 1.53^a	52.76 ± 5.20^a	1837.50 ± 10.02^a
B	1	49.27 ± 2.15^b	26.83 ± 3.49^b	987.80 ± 2.87^b
C	3	56.20 ± 3.56^b	43.27 ± 5.70^a	552.54 ± 5.11^b
D	7	22.08 ± 1.40^a	41.60 ± 5.89^a	1679.17 ± 13.37^a

Table No. 2: Aspartate transaminase activities (U/l) on administration of aqueous extract of cassia leaves in albino rat tissues

Groups	Days of sacrifice	Serum	Liver	Kidney
1	0	55.60 ± 11.10^a	223.00 ± 9.89^a	271.00 ± 9.86^a
2	1	111.00 ± 3.50^b	205.00 ± 09.88^a	345.57 ± 24.00^b
3	3	137.76 ± 5.55^b	116.30 ± 11.84^b	350.00 ± 6.95^b
4	7	80.00 ± 12.10^a	204.00 ± 9.87^a	254.00 ± 9.15^a

Values are expressed as mean ±standard error mean [SEM] Statistical significance was tested using student's t- test compared with control values at $P<0.05$. Values with different superscript are significantly different.

Table No.3: Alanine transaminase activities (U/l) on administration of aqueous extract of cassia leaves in albino rat tissues

Groups	Days of sacrifice	Serum	Liver	Kidney
1	0	34.30 ± 2.86 [a]	163.00 ± 1.41 [a]	91.00 ± 4.51 [a]
2	1	47.00± 7.86 [b]	162.00 ± 15.20 [a]	124.03 ± 3.60 [b]
3	3	68.30 ± 2.49 [b]	133.00 ± 3.74 [b]	131.43 ± 1.23 [b]
4	7	44.00 ± 6.40 [a]	156.30 ± 2.05 [a]	119.00± 3.65 [a]

Table No.4: Protein and glucose concentrations on administration of cassia leaves in the serum of albino rats

Groups	Days of sacrifice	Protein (g/l)	Glucose (mg/dl)
1	0	61.92± 1.89 [a]	7.70± 0.75 [a]
2	1	102.72± 9.41 [b]	4.63± 1.78 [b]
3	3	121.00± 6.65 [b]	4.59± 0.31 [b]
4	7	69.65± 2.94 [a]	8.00± 0.16 [a]

Values are expressed as mean ±standard error mean [SEM] Statistical significance was tested using student's t- test compared with control values at P<0.05. Values with different superscript are significantly different.

significantly different (P<0.05) was notice in the kidney and serum levels of these enzymes when compared with the control. This was accompanied with a decrease in the liver. The results of this study also indicate that the effect of the extract increases as concentration increases since a more pronounced effect is seen in group C animals; this concentration effect correlates with the explanation of [17]. The result of this study also shows that administration of the extract leads to an increase in serum protein and a decrease in the blood glucose level.

CONCLUSIONS

The results of this investigation show that the tissues are the site of injury as a result of repeated administration of the extract. This implies that high dosage or prolonged use of the extract can cause irreversible tissue injury due to disruption of the plasma membrane leading to loss of enzyme activity. Therefore prolonged usage of the plant should be discouraged. However, the plant has hypoglycaemic effect.

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