



HYPERGLYCEMIC EFFECT AND HYPERTOTOXICITY STUDIES OF STEM BARK OF *KHAYA SENEGALENSIS* AND LEAF EXTRACT OF *CAMELLIA SINESIS*

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ABSTRACT

Hepatotoxic properties of the aqueous leaves of highland tea (Camellia sinensis) and aqueous stem bark extract of Khaya senegalensis were studied in rats. This was done by assaying the serum activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), glucose and bilirubin in rats administered with 6.5mg/Kg (group A), 4.35mg/Kg (group B) and 3.0mg/Kg (group C) of the extract for seven (7) days respectively. The serum AST, ALT, ALP, glucose, bilirubin (total) and bilirubin (direct) in the control rats (group D) were found to be 7.62 ± 1.78 U/L, 11.2 ± 0.38 U/L, 144.9 ± 23.90 U/L, 4.39 ± 0.08 mmol/l, 0.14 ± 0.03 mg/dl and 0.18 ± 0.04 mg/dl respectively. The serum AST, ALT, glucose, bilirubin (total) and bilirubin (direct) in group A rats showed significant increase ($P < 0.05$) compared to the levels in control rats. Serum AST, ALT, ALP, glucose, bilirubin (total and direct) showed significant increase ($P < 0.05$) in groups B and C rats but were lower than those of group A. The results indicate that the extract of Khaya senegalensis stem bark and highland (green) tea leaves caused increased activity of the liver enzymes studied which is an important biochemical symptoms of cytolysis and hepatotoxicity. In addition, administration of the extract led to increase in serum glucose in rats, indicating hyperglycemic effect.

Keywords: Hyperglycemia, Hypertoxicity, Camella sinesis, Extract

INTRODUCTION

Camellia sinesis (Highland Tea) is the tea plant specie whose leaves and leaf buds are used to produce tea. The tea consists of four main varieties: white tea, green tea, oolong and black tea. These varieties are processed differently to attain different levels of oxidation (Cheun, 2002). Leaves of *C. sinesis* have been used in traditional Chinese medicine (TCM) and other medical systems to treat asthma, angina pectoris, peripheral vascular disease and coronary artery disease

(http://en.wikipedia.org/wiki/Camellia_sinesis).

Khaya senegalensis (Juss) (African mahogany) a dry zone mahogany belonging to the family: Maliceae is highly reputed for its numerous medicinal uses and has been reported to be used indigenously in the treatment of trypanosomiasis (Atawodi *et al.*, 2001). The active compounds present in the stem bark of *K senegalensis* are saponins, tannins, alkaloids, glycosides, steroids terpenoids and flavonoids (Makut *et al.*, 2007).

Highland tea and African Mahogany are among the ingredients used in the preparation of "Gadagi" tea. "Gadagi" tea is used mostly by youth in Hausa society as a hot beverage. It is suspected to be the cause of high rate of road accidents caused by commercial cyclists (Yan achaba) and other commercial vehicle drivers. This work is aimed at investigating whether highland tea and African mahogany stem bark have hepatotoxic effect on experimental animals

and their effect on serum glucose in the animals. Specifically, the work entails investigating the activities of liver enzymes (ALT; AST and ALS) in rats administered with mahogany stem bark and highland tea leaves aqueous extracts.

MATERIALS AND METHODS

Treatment of Rats

Sixteen (16) male albino rats (weighing 100 – 280g) were obtained from pharmacology Department Bayero University, Kano. The rats were kept in animal cages at room temperature, with free access to commercial poultry feed (Grower mash) and water. The animals were divided into four groups of four animals each (Groups A, B, C and D). Rats in group D served as the control, and were not treated with the extract, but were allowed free access to food and water. Rats in groups A, B and C were administered with the extracts orally (1cm³) on a daily basis for seven (7) days. At the end of the period of administration, the animals were sacrificed. Blood samples were collected from each animals and sera separated.

Biochemical Analysis

Serum glucose level was assayed as outlined by Barham and Trinder (1972). The method of Reitman and Frankel (1957) was used to determine serum activities of ALT and AST. Serum ALP activity was estimated according to the method of Rec (1972), while serum bilirubin level was determined as outlined by Jendrassik and Grof (1938).

MATERIALS AND METHODS

Collection and preparation of samples

Samples of *Khaya senegalensis* stem bark, cut from trees located within Bayero University, Kano old site were collected in June, 2008. The stem bark were dried at room temperature and pounded into fine powder using mortar and pestle. The powder was sieved, then 2g and 1g of the powder were soaked in 100cm³ of water respectively and allowed to stand for 24 hours with occasional shaking in a conical flask.

The extracts from *K senegalensis* stem bark and that from high land tea were mixed according to the following proportion:-

Group A: 2g *K. senegalensis*/100cm³ water: 1g high land tea / 100cm³ water

Group B: 1g *K. senegalensis*/100cm³ water: 2g high land tea / 100cm³ water

Group C: 2g *K. senegalensis*/100cm³ water: 2g high land tea / 100cm³ water

The volume of the extracts (filtrates) administered was 1cm³ each. Each cm³ of the extract contains 30mg (Group A), 30mg(Group B) and 40mg (Group C).

Statistical analysis

Values obtained were analysed statistically using students 't'-tests.

RESULTS AND DISCUSSION

Dose- dependent increase in mean serum AST, ALT, and ALP activities and concentrations of glucose and total bilirubin were observed in the animals administered with aqueous extracts of *K senegalensis* and *C sinensis* (Table 1). Additionally, mean serum AST, ALT and ALP activities, concentration of glucose and bilirubin were significantly lower (P<0.05) in control (Group D) than in Groups A, B and C.

The dose dependent variation in mean serum AST, ALT and ALP activities indicates that a 1:1 proportion effect of the two plant aqueous extracts is more potent in the hepatotoxic effect of the aqueous extract observed in this work. However, the hepatotoxic effects of each plant extract needs to be assessed separately. AST is an enzyme similar to ALT but is less specific for liver disease as it is also produced in muscle and can be elevated in other conditions such as in heart attack (Worman, 1998). The high level of serum AST and ALT is an indication of liver damage, ALT being more specific for liver injury than AST (Broundwald *et al.*, 2001). Serum ALT

Later, the mixtures were filtered using Whatman no1 filter paper, the residues were dried in a hot air oven and reweighed again.

High land tea (*Camella sinensis*) leaves (dried) were bought from sabon Gari market, Kano. The leaves (3g) were boiled in water (100cm³) for 15 minutes. The mixture was allowed to cool and later centrifuged. The residue was dried in hot air oven and reweighed again.

levels provides a useful but non specific indication of liver or bone disease (Jacobs *et al.*, 1994).

The dose dependent variation in mean serum glucose concentration observed in Groups A, B and C and the significantly higher (P<0.05) mean values than in Group D, indicates hyperglycaemic effect of the extract administered. Whether this hyperglycaemic effect is responsible for the endurance of the popular Okada riders or "Yan achaba" remains to be proved. The hepatotoxic effect of the extract is further strengthened by the increased mean serum total bilirubin levels in Group A, B and C than in controls (Group)

In conclusion the results of this work indicate that at the dose levels administered aqueous extract of *K. senegalensis* and *C.sinensis*, have hepatotoxic and hyperglycaemic effects. In view of this finding, there is need for caution in the consumption of Gadagi tea. To further strengthen this assertion, it is suggested that this kind of study should be conducted on human subjects more particularly the "Okada" riders.

Table 1: Mean Serum Activities of AST, ALT, ALP and Concentrations of glucose and direct bilirubin in rats after administration of aqueous extracts of highland tea leaves and African mahogany stem bark for seven (7) days.

Animals	Dose administered (mg/kg)	AST (U/L)	ALT (U/L)	ALP (U/L)	Glucose (mmol/l)	Total Bilirubin (mmol)
Group A n = 4	3.50	12.75 ^a ±8.9	13.73 ^a ±7.46	317.40 ^a ±7.77	6.86 ^a ±1.76	0.279 ±0.09
Group B n = 4	4.35	13.52 ^a ±3.59	18.53 ^a ±10.12	310.45 ^a ±7.59	7.25 ^a ±2.19	0.27 ^a ±0.09
Group C n = 4	6.50	17.52 ^a ±5.91	20.91 ^a ±7.88	372.25 ^a ±9.15	9.56 ^a ±5.74	0.46 ^a ±0.24
Group D n = 4 control		7.62 ±1.78	11.20 ±0.38	144.90 ±23.90	4.39 ±0.08	0.14 ±0.03

Results are expressed as mean ± standard deviation

Values with superscript "a" indicate significant difference compared to control at P < 0.05

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