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Full Length Research Paper

Effect of administration of aqueous extract of *Bambusa vulgaris* leaves on some biochemical variables of rat liver and serum

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The effect of aqueous extract of *Bambusa vulgaris* leaves on some biochemical variables of rat liver and serum was studied. Twenty-four female albino rats (*Rattus novergicus*) were used and they were divided into four groups of 6 rats each. Group A (control) was administered 1 ml of distilled water. The experimental groups namely B, C and D were administered 80, 100 and 120 mg/kg body weight of the extract respectively. The extract was administered every 12 h for seven days after which the rats were sacrificed and the activities of alkaline phosphatase (ALP), acid phosphatase (ACP), alanine aminotransferase (ALT), aspartate amino transferase (AST) and superoxide dismutase (SOD) activity as well as malondialdehyde (MDA) concentration were determined. The extract caused a significant reduction ($P < 0.05$) in ALP activities in the liver and significant increase ($P < 0.05$) in the serum at the three doses administered. The extract also significantly increased ACP activities ($P < 0.05$) in the liver and serum in all the treatment groups when compared with controls. ALT and AST activities were significantly lowered in the liver in all the groups while there was a significant elevation in the serum when compared with controls. The SOD activity and MDA concentration were significantly elevated ($P < 0.05$) in all the treatment groups in both the liver and serum when compared with controls. The pattern of results show that the aqueous extract of *B. vulgaris* leaves may contain some toxic substances which might cause overload of the endogenous biotransformation capacity of hepatic cells.

Key words: *Bambusa vulgaris,* leaves, biochemical parameters, liver.

INTRODUCTION

Bambusa vulgaris, commonly known as "Bamboo" is a group of woody perennial evergreen plants in the true grass family poacea, sub-family Bambusoideae, tribe Bambuseae. It is made of about 91 genera and over 1000 species found in diverse climates from cold mountains to hot tropical regions (Bystriakova et al., 2003). *B. vulgaris* is the most widely distributed bamboo species in the world (McClure, 1967). Its distribution has been a direct result of mankind, in that the many uses it could serve were appreciated by man. Its widespread distribution can also be attributed to an appreciation of its aesthetic value, ease of propagation, medicinal properties as well as food value. B. vulgaris is characterized with an open clump with boldly beautiful lemon yellow culms with exquisite green stripes and dark green leaves. Report on the analysis of leaves of *B. vulgaris* revealed a moisture content of 8.6%, crude protein of 10.1%, ether extract of 2.5%, crude fibre of 21.7% and ash of 21.3% while phosphorus was 86.0 mg/100 g, iron 13.4 mg/100 g, vitamin B_1 0.1 mg/100 g, vitamin B_2 2.54 mg/100 g and carotene 12.32 mg/100 g (Tamolang et al., 1980).

B. vulgaris has been identified as a component of several formulas of medicinal importance. The leaves of *B. vulgaris* are used for the treatment of labour pains (Lans et al., 2007), inflammatory conditions (Carrey et al., 2009) and hypertension (Koffi et al., 2009). Other traditional uses are astringent, emmanogogue (drug that

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promotes or regulates menstrual flow), vulnerary and febrifuge to heal the wounds and also to control diarrhea in cattle (Kirtikar and Basu, 1990). Preliminary chemical screening of the aqueous extract of *B. vulgaris* leaves revealed the presence of alkaloids, tannins, phenolics, glycosides, saponins, flavonoids and anthraquinones (Yakubu and Bukoye, 2009). Though the plant extracts have been used in the folklore medicine extensively, there is paucity of information about their safety for the acclaimed potentials. Keeping this in view, the present study has been undertaken to investigate the effects of aqueous extract of *B. vulgaris* leaves on some biochemical variables of rat (*Rattus novergicus*) liver and serum so as to ascertain the safety of the extract. The effect of the extract on the activities of the various bio-chemical markers such as alkaline phosphatase (ALP), acid phosphatase (ACP), alanine aminotransferases (ALT) and superoxide dismutase (SOD) activities and malondialdehyde (MDA) concentration are discussed.

MATERIALS AND METHODS

Animals and reagents

Twenty-four albino rats (*R. novergicus*) with an average weight of 148.35 g used for this study were obtained from the small animal holding unit of the Department of Biochemistry, University of Ilorin, Ilorin, Nigeria. They were fed with normal animal feed and given water *ad libitum* throughout the experimental period. Animal husbandry and experimentation were consistent with the guiding principles in the use of animals in toxicology. All the reagents used for this study were of analytical grade and were prepared in all glass-distilled water.

Preparation of plant extract

The bamboo leaves were obtained from a bamboo tree along Pipeline road, Tanke, Ilorin, Nigeria. The leaves were air dried and milled into powder. 200 g of the powder were then percolated in 500 ml of distilled water for two weeks. The percolated mixture was filtered and evaporated on a water bath according to the method of Majekodunmi et al. (1996). A homogenous aqueous suspension of the extract was made before being administered to the experimental animals.

Administration of extract

The experimental animals were randomly divided into four groups (of six rats each) which were designated A (control), B, C and D. The rats in group A were administered 1 ml distilled water orally while rats in groups B - D were administered the aqueous extract in varying doses daily (80, 100 and 120 mg/kg body weights respectively) for seven days.

Sample preparation

At the end of the experimental period, venous blood was collected from the experimental animals according to the method of Narayanan et al. (1984). The serum was prepared by centrifuging the blood samples at 3000 rpm for 5 min (Ogbu and Okechukwu, 2001) and collected by pipetting. The animals were thereafter quickly dissected and the liver removed. The liver was suspended in ice-cold 0.25 M sucrose solution and homogenized. The resulting homogenates were diluted appropriately with 0.25 M ice-cold sucrose solution to give a final volume of five folds the initial tissue weight. The homogenates were kept frozen overnight to ensure maximum release of the enzymes (Ngaha et al., 1989).

Assay of biochemical variables

Alkaline phosphatase (ALP, EC 3.1.3.1) and acid phosphatase (ACP, EC.3.1.3.2) activities were determined by the method of Ahamed and King (1959) while the activities of aspartate and alanine aminotransferases (AST, EC 2.6.1.1 and ALT, EC 2.6.1.2 respectively) were determined by the method of Reitman and Frankel (1957). The method employed in the assay of superoxide dismutase (SOD, 1.15.1.1) activity was that of Winterbourne et al. (1975) and is based on the ability of superoxide dismutase to inhibit the reduction of nitroblue tetrazolium by superoxide. Determination of malondialdehyde level was obtained by the method of Varshney and Kale (1990). Protein content of the homogenate and serum were determined using the Biuret method (Gornal et al., 1949).

Statistical analysis

All data were analyzed using a one-way ANOVA. In all cases, probability level of 95% was taken as significant (Mahajan, 1997).

RESULTS

The effect of twelve hourly administration of aqueous extract of *B. vulgaris* on alkaline phosphatase (ALP) activity of the liver and serum of both control and experimental animals is represented in Table 1. The administration of the extract twice daily for seven days led to significant reduction ($P < 0.05$) in the liver ALP activity with a corresponding significant increase ($P < 0.05$) in the serum in all treatment groups when compared with the controls. Table 2 shows the effect of twelve hourly administration of aqueous extract of *B. vulgaris* on rat liver and serum acid phosphatase (ACP) activity. The extract significantly increased ($P < 0.05$) ACP activities in the liver and serum in all the treatment groups when compared with controls.

Tables 3 and 4 shows the effects of the twelve hourly administration of the extract for seven days on activities of ALT and AST respectively in both the liver and serum. ALT and AST activities in the liver of experimental animals in all the treatment groups were significantly reduced ($P < 0.05$) while their serum activities were significantly elevated when compared with controls. Table 5 shows the effect of administration of aqueous extract of *B. vulgaris* on rat liver SOD activity. There was a significant increase ($P < 0.05$) in the activity of the enzyme at doses of 80, 100 and 120 mg/kg body weights of the extract in the liver with a concomitant significant increase ($P < 0.05$) in the serum in all the treatment groups when compared with controls.Effect of administration of aqueous extract of *B. vulgaris* on MDA concentration of rat liver and serum is represented in

Table 1. Effect of twelve hourly administration of aqueous extract of *B. vulgaris* for seven days on rat liver and serum ALP activity.

Groups	ALP activities (IU/L)	
	Liver	Serum
A	245.80[a]	50.20[a]
B	210.33[b]	78.17[b]
C	225.00[b]	70.80[b]
D	221.00[b]	89.20[b]

Each value is a mean of 6 determinations. Values along the column with different superscripts are significantly different.

Table 2. Effect of twelve hourly administration of aqueous extract of *B. vulgaris* for seven days on rat liver and serum ACP activity.

Groups	ACP activities (IU/L)	
	Liver	Serum
A	2648.40[a]	28.40[a]
B	3005.67[b]	49.00[b]
C	3364.67[b]	50.83[b]
D	2892.60[b]	48.60[b]

Each value is a mean of 6 determinations. Values along the column with different superscripts are significantly different.

Table 3. Effect of twelve hourly administration of aqueous extract of *B. vulgaris* for seven days on rat liver and serum ALT activity.

Groups	ALT activities (IU/L)	
	Liver	Serum
A	1374.00[a]	39.80[a]
B	1102.60[b]	59.67[b]
C	1165.00[b]	48.67[b]
D	1163.20[b]	46.00[b]

Each value is a mean of 6 determinations. Values along the column with different superscripts are significantly different.

Table 4. Effect of twelve hourly administration of aqueous extract of *B. vulgaris* for seven days on rat liver and serum AST activity.

Groups	AST activities (IU/L)	
	Liver	Serum
A	1681.80[a]	147.00[a]
B	1031.17[b]	185.83[b]
C	1021.80[b]	179.33[b]
D	1034.60[b]	178.60[b]

Each value is a mean of 6 determinations. Values along the column with different superscripts are significantly different.

Table 6. The data revealed that the extract significantly caused elevation ($P < 0.05$) of MDA at doses of 80, 100 and 120 mg/kg body weights when compared with control.

Table 5. Effect of twelve hourly administration of aqueous extract of *B. vulgaris* for seven days on rat liver and serum SOD activity.

Groups	SOD Activities (µmol/ml)	
	Liver	Serum
A	30200[a]	150.00[a]
B	32555[b]	185.00[b]
C	34500[c]	173.67[b]
D	38400[d]	168.60[b]

Each value is a mean of 6 determinations. Values along the column with different superscripts are significantly different

Table 6. Effect of twelve hourly administration of aqueous extract of *B. vulgaris* for seven days on rat liver and serum MDA activity.

Groups	MDA concentration (µmol/L)	
	Liver	Serum
A	31.40[a]	1.15[a]
B	52.33[b]	2.59[b]
C	78.50[b]	2.48[b]
D	79.40[b]	2.62[b]

Each value is a mean of 6 determinations. Values along the column with different superscripts are significantly different.

DISCUSSION

Alkaline phosphatase has been employed to assess the integrity of plasma membrane and endoplasmic reticulum (Wright and Plummer, 1974; Akanji et al., 1993). It is required in certain amount in tissues for proper functioning of the organs (Brain and Kay, 1927) but when present in large amount, it constitutes a threat to the life of the cells which are dependent on a variety of phosphate esters for their vital processes since it may indiscriminately hydrolyze orthophosphate monoesters in the organs (Butterworth and Moss, 1966). Results of ALP activity from this study suggest that the integrity of cellular membrane systems of rat liver was compromised by the administration of the extract. Therefore, the observed significant increase in ACP activity in the liver could be due to enzyme induction. The concomitant increase in ACP activity in the serum would be expected since the plasma membrane has been compromised. The significant reduction in ALT and AST activities of the liver as well as the corresponding increase in their serum activities following the administration of the extract may have resulted from leakage into the extracellular fluids occasioned by plasma membrane derangement by the constituents of the extract leading to excessive leakage of cytosolic materials (Huang et al., 2009).

SOD is an antioxidant enzyme which mops up free-radicals. It protects oxygen metabolizing cells against harmful effects of free-radicals (Petkau et al., 1975). The observed significant increase in SOD activity of the liver in all the treatment groups suggests the free radical generating potential of the extract which consequently led to increased synthesis of SOD to mop up the free radicals. The observed significant increase in the enzyme activity in the serum could be as a result of leakage of the enzyme from the liver since the plasma membrane was already deranged as suggested by the results obtained from ALP assay. This is further corroborated by the level of MDA observed in both the liver and serum. Malondiadehyde is a metabolic product of lipid peroxidation, the level of which is increased in oxidative stress. Oxidative stress is the condition where reactive oxygen species (ROS) generation exceeds endogenous antioxidant defense which consequently lead to tissue and cell injury (Sen, 1995; Robbin et al., 1999). The present study showed a significant elevation in MDA levels in both the liver and serum following the administration of the aqueous extract of *B. vulgaris*. This suggests a stimulation of lipoperoxidation by the constituents of the extract while the significant increase in MDA concentration of the serum may be due to leakage of end product of lipoperoxidation (MDA) into the serum as a result of plasma membrane damage.

The observed increase in SOD activity and thiobarbituric reacting substance (TBARS) or MDA concentration implies that the extract is capable of inducing free radical production which may overload the endogenous biotransformation capacity of the cells. It has

been reported that during oxidative stress, MDA and other aldehydes are formed in biological systems which can interact with protein and DNA to introduce crosslinkages thus resulting into alterations in replication, transcription and consequently tumor formation (Perchellet and Perchellet, 1989).

The study therefore provided information on the consequences of indiscriminate use of the aqueous crude extract of *B. vulgaris* which may have some toxic constituents despite its numerous medicinal properties.

REFERENCES

Ahamed Z, King EJ (1959). Kinetics and plancental alkaline phosphatase. Biochem. Biophy. Acta, 34: 313.

Akanji MA, Olagoke OA, Oloyede OB (1993). Effect of chronic consumption of metabisulphite on the integrity of the rat kidney cellular system. Toxicol., 81: 173-179.

Brain RI, Kay KO (1927). Kidney phosphatase II: The enzyme in disease. Biochem. J., 21: 1104-1103.

Butterworth PJ, Moss DW (1966). Action of neuraminidase on human kidney alkaline phosphatase. Nat., 209: 805-810.

Bystriakova NV, Kapos I, Lysenko C, Stapleton MA (2003). Distribution and conservation status of forest bamboo biodiversity in the Asia-Pacific Region, pp.1833-1841.

Gornall A, Bardsmill CT, David MM (1949). Determination of serum protein by means of biuret reaction. J. Biol. Chem., 177: 751-766

Kirtikar KR, Basu BD (1990). Indian Medicinal Plants, International Book Distributors, New Delhi. pp. 2724-2727.

Koffi N, Noel ZG, Theodore ED (2009). Hypotensive effect of aqeous extract of *Bambusa vulgaris* sheets on the arterial pressure of rabbits. Am. J. Sci. Res., 2: 60-72

Lans C, Georges K, Brown G (2007). Non-experimental validation of ethnoveterinary plants and indigenous knowledge used for backyard pigs and chickens in Trinidad and Tobago . Trop. Anim. Health Prod. 39: 375-385

Mahjan BK (1997**)**. Significance of difference in means. In methods in Biostatistic for Medical Workers, 6th Edition. New Delhi JAYPEE Brothers Medical Publisher, pp. 130-155.

Majekodunmi OF, Zany I, Ohanyaga IE, Shi LE, Mclanghin JL, (1996). Selective cytotoxic diterpene from Euphorbia poisonic. J. Med. Chem., 39: 1005-1008

McClure FA (1967). The bamboos: a fresh perspective. Harvard University Press, Massachusetts, p. 343.

Narayanan CR, Joshi DD, Maunder AM (1984). Hypoglycemic action of *Bougainvillea spectabilis* leaves. Curr. Sci., 53: 579-58

Ngaha EO, Akanji MA, Madusolomo MA (1989). Studies on correlation between chloroquine-induced tissue damage and serum changes in rats. Experimentia, 45: 143.

Ogbu SI, Okechukwu EI (2001). The effect of storage temperature prior to separation on plasma and serum potassium. J.Med. Lab. Sci., 10: 1-4

Perchellet JP, Perchellet M (1989). Antioxidant and multistage carcinogenesis in mouse skin. Free Radical Biol. Med., 7: 377-408.

Petkau A, Chelack W, Pleskach S, Mecker B, Brandy C (1975). Radio protection of mice by superoxide dismutase. Biochem. Biophys. Res. Commun. 65:66.

Reitman S, Frankel S (1957). A colorimetric method for the determination of serum glutamic oxaloacetic and glutamic pyruvic transaminase. Am. J. Clin. Pathol., 28: 56 - 63.

Robbin SL, Cotran RS, Kumar V, Collins T (1999). Pathological basis of disease, 6th ed, Har Cocert Asia: Saunders Company.

Sen CK (1995). Oxygen toxicity and antioxidants: State of the art. Indian J. Physiol. Pharmacol., 39: 177-96.

Varshey R, Kale RK (1990). Effect of calmodulin antagonist on radiation induced lipid peroxidation in microsome. Int. J. Rad. Biol., 58: 733-743.

Winterbourn JJ, Fernandez EA, Halliwell GL (1995). MDA formation from lipid peroxidation in the TBA test. J. Appl. Biochem., 5: 311-340.

Wright PJ, Plummer DT (1974). The use of urinary enzyme measurement to detect renal damage caused by nephritic compounds. Biochem. Pharmacol., 23: 65-73.

Yakubu MT, Bukoye BB (2009). Abortifacient potentials of the aqueous extract of Bambusa vulgaris leaves in pregnant Dutch rabbits. Contracept., 80: 308–313.