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Hematological and biochemical parameters in chinchilla rabbits treated with *Caulis bambusae* (Bamboo) stem extract

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ABSTRACT

This study investigated the effects of Caulis bambusae stem extract on haematological and biochemical parameters rabbits to ascertain possible toxicity. Twelve aged matched healthy adult male chinchilla rabbits (1.80 ± 0.05–2.0 ± 0.11kg body weight) were divided into three groups. Group 1 was given distilled water in addition to normal feed and served as the control. Groups 2 and 3 were treated with 2.5 and 5ml of aqueoue extract of Caulis bambusae by oral intubation. Treatment lasted 90 days with blood collected on days 30, 60.And 90 for analysis. Results obtained revealed no significant difference (P>0.05) in red blood cells (RBC), haemoglobin (Hb), Packed cell volume (PCV), Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) and Platelets counts between the treatment groups and control. White blood cell count was significantly (P<0.05) elevated in treatment groups. Glucose, Protein, Aspartate amino transferase (AST), Alanine amino transferase (ALT), Alkaline phosphotase (ALP) and Acid phosphotase (ACP) levels were also not significantly affected (P>0.05) when compared to the control. Total cholesterol (TC), Triglycerides (TG), High density lipoprotein cholesterol (HDL-C) and Low density lipoprotein cholesterol (LDL-C) were however significantly decreased (P<0.05) in the treatment groups. The results suggest thatCaulis bambusae stem extract has no adverse effect on the haematological and biochemical profile of treated experimental animals but showed evidence of hypolipidaemic activity which could be of value in the management of cardiovascular problems.

Key Words: Biochemical, *Caulis bambusae*, Haematological, Rabbits

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INTRODUCTION

The useof plant materialsfor medicinal purposes is an ancient practice which has of late come under serious scrutiny.This widespread acceptance may be for reasons of cost, availability, accessibility, effectivenessand the fact that the tropics into which majority of Africa lies is host to a lot of medicinal plants. These plants have in addition to their healing potentials provided templates for the development of new orthodox synthetic drugs [1]. [2], had reported that the primary aim of sourcing for plants drug through any of the known strategies is mainly to detect the active ingredients in plants that exert definite pharmacological effects in the body, since the results of such

investigations would most often serve as a lead for the biological evaluation of these plants and to new drug discovery.

Haematologicaland biochemical parameters have been associated with health indices and are of diagnostic significance in routine evaluation of the state of health; hence the analysis of these parameters is relevant to risk evaluations of alterations of the haematological system in humans and other animals [3]. Several medicinal plants have been screened for haematological effects which could be positive or negative depending on the phytochemical composition and level of toxicity of such plants materials. *Caulis bambusae* is one out of the numerous plants that are currently being evaluated.

Caulis bambusae, commonly known as bamboo and belonging to family *bambusoideae* is commonly found in the tropical and subtropical area of Asia, where the plants is seen to have widespread ecological, environmental and social benefits[4]. In Eastern Asia extracts from the plant are used to treat coughs and asthma. Recent scientific examination of *Caulis bambusae*stem extract revealed anti-inflammatory, anti-allergic, immune regulating and anti-oxidative capacities [5]. The extract has also being used to treat diseases such as haemorrhoids[6], scabies, eczema and dermatitis [7].

This study washowever designed to evaluate the haematological and biochemical effects of stem extract of*Caulis bambusea*(SECB), to ascertain its haematological safety margin and to improve on the scanty scientific literature available on the plant.

MATERIALS AND METHODS

2.1 Collection of Plant material and preparation stem Extract

Fresh stems of *Caulis bambusea*were collected from Agbo, IkaLocal Government Area of Delta State, Nigeria. The stems were separated from other plants parts, cut into smaller pieces and dried at a temperature of 33-34^{0}C. The dried stems were pulverized in a mill (Pyecan, England) to obtain a powdered sample which was labeled and kept in a clean airtight container for further use.

2.2 Experimental Animals

Twelve adult healthy male chinchilla rabbits (1.80-2.0kg) procured from the Animal house of the Pharmacology Department, University of Benin, Edo State, Nigeria, were used. They were kept in a well ventilated stainless cages measuring (4ft x 2ft x2ft) in a room and fed with standard feed, with water *ad libitum*and were given a one week period to acclimatize before the commencement of treatment. All animal experiments were conducted in compliance with NIH guidelines for care and use of laboratory Animals (Pub. No.85-23, Revised, 1985, as expressed by [8]. The study was carried out in the Pharmacology Laboratory of the University of Benin, Edo state, Nigeria.

2.3 Grouping of Animals

The cages were labeled group 1 to 3 with each group containing 4 animals. Group 1 animals were assigned sterile water in addition to normal feed.Group 2 animals were assigned a daily oral dose of 2.5ml aqueous extract of *Caulis bambusae*, while group 3 animals were treated with 5.0ml of *Caulis bambusae*. Treatment lasted for 90 days.

2.4 Collection of blood sample for haematological studies

Blood samples were collected from the ear vein of the rabbits on days 30, 60 and 90 into K_2EDTA bottles for determination of haematological parameters, while another 5ml of blood was transferred into plain tubes and used for determination of biochemical parameters.

2.4.1 Haematological studies

Haematological parameters were determined at the Antiretroviral Unit, Central Hospital, Agbor, Delta State. Haemoglobin concentration was measured by the Cyanmethaemoglobin method described by [9]. Packed cell volume was determined using the method described by Jain, (1986), Total red blood cell counts was determined according to the visual method of Dacie and Lewis [9]. Total white blood cells counts were estimated using thehaemocytometer method described by [11]. Platelets counts were determined using the method of Rees-Ecker as reported by [12].Other red blood cell parameters including, mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) were obtained by calculations as expressed by [12].

MCV in femtolitres(fl) = $\frac{\text{PCV x 10}}{\text{RBC (in millions/ml)}}$

MCH in Picogrammes(pg) = $\frac{\text{Haemoglobin (g/dl) x 10}}{\text{RBC (in millions/ml)}}$

2.4.2 Biochemical Parameters

Fasting blood glucose was measured by the glucose oxidase method of Barham and Trinder (1972), as specified by the kit producer, Randox Laboratories, UK. Total protein was estimated by the method of Tietz (1995), Urea by the Urease-Berthelot Method (Weatherburn, [13], Creatinine by the Henry method [14], Alkaline phosphotase (ALP) as recommended by DeuscheGesellschaft fur KlinischeChemie, (1972), AST and ALT by the method of Reitman and Frankel, (1957). Lipid profile parameters including total cholesterol, triglycerides, high density lipoprotein cholesterol (HDL-C) and low density lipoprotein cholesterol were obtained following standard procedures outlined by the commercial kit producer, Randox Laboratories, UK.

2.5 Statistical Analysis

Results were expressed as means± standard deviation (SD).Statistical significance of the difference between groups was analysed using student t-test and one-way analysis of variance (ANOVA), SPSS, version 16 software was employed. Means were considered statistically significant at 95% level of confidence.

RESULTS

3.1Effects of *Caulis bambusae* stem extract on haematological parameters of chinchilla rabbits after 30 days of treatment

Treatment with *Caulis bambusae* stem extract at all doses did not significantly (P> 0.05) affect RBC, PCV, Hb, MCV, MCH, WBC and Platelets values in the treated rabbits after 30, 60 and 90 days of daily administration. No haematoxic effect was observed. Thehaematologicalvalues in the treated rabbits instead compared favourably with those of the control rabbits (Tables 1, 2 and 3).

Table 1: Haematological profile of chinchilla rabbits after 30 days oftreatment withstem extract of *Caulis bambusae (SECB)*

Parameter	Group 1	Group 2	Group 3
Treatment(ml)	Control	2.5ml, SECB	5.0ml, SECB
RBCx10^6/mm^3	7.64± 0.72	7.54± 0.54	7.92± 0.46
PCV(%)	40.50 ± 2.50	39.50 ± 1.90	40.50 ± 2.03
Hb (g/dl)	13.40 ± 0.76	13.30 ± 0.51	13.40 ± 0.03
MCV (fl)	53.00 ± 2.12	52.40 ± 1.00	51.10 ± 2.30
MCH (pg)	19.00 ± 0.18	19.50 ± 0.07	18.50 ± 0.07
WBCx10^3/mm^3	5.50 ± 0.12	6.00 ± 0.31	4.50 ± 1.62
Platelets/mm^3	396 ± 0.60	397 ± 1.50	400 ± 1.11

P> 0.05 for test versus control

Table 2: Haematological profile of chinchilla rabbits after 60 days of treatment with stem extract of *Caulis bambusae (SECB)*

Parameter	Group 1	Group 2	Group 3
Treatment(ml)	Control	2.5ml, SECB	5.0ml, SECB
RBCx10^6/mm^3	6.70± 0.90	7.82± 1.03	7.83± 1.08
PCV(%)	35.50 ± 1.15	41.20 ± 1.90	40.00 ± 0.08
Hb (g/dl)	14.00 ± 1.80	13.60 ± 1.96	13.00 ± 2.03
MCV (fl)	53.00 ± 2.05	52.70 ± 1.08	51.10 ± 1.07
MCH (pg)	19.20 ± 1.06	18.50 ± 0.17	17.30 ± 0.27
WBCx10^3/mm^3	5.50 ± 0.10	5.80 ± 1.02	4.70 ± 1.08
Platelets/mm^3	396.30 ± 0.08	390 ± 0.60	389 ± 1.03

P> 0.05 for test versus control

Table 3: Haematological profile of chinchilla rabbits after 90 days of treatment with stem extract of *Caulis bambusae (SECB)*

Parameter	Group 1	Group 2	Group 3
Treatment(ml)	Control	2.5ml, SECB	5.0ml, SECB
RBCx10^6/mm^3	7.73 ± 0.90	7.77 ± 1.03	7.45 ± 1.08
PCV(%)	41.00 ± 1.20	41.20 ± 2.02	38.00 ± 1.09
Hb (g/dl)	13.50 ± 0.36	13.60 ± 2.13	12.60 ± 1.08
MCV (fl)	53.00 ± 2.03	53.00 ± 1.80	51.00 ± 1.15
MCH (pg)	19.20 ± 1.20	18.80 ± 0.10	17.00 ± 0.25
WBCx10^3/mm^3	5.40 ± 1.01	5.90 ± 0.08	4.50 ± 0.17
Platelets/mm^3	396.30 ± 0.12	386 ± 0.15	395 ± 0.80

P> 0.05 for test versus control

3.2 Effect of *Caulis bambusae* stem extract on some Biochemical Parameters in chinchilla rabbits

There was no significant change (P> 0.05) in the levels of glucose, protein, urea, creatinine, Aspartate amino transferase (AST), Alanine amino transferase (ALT), Alkaline phosphatase (ALP) and Acid phosphatase (ACP) after all stages of treatment, as these biochemical values in the the treated rabbits compared favourably with that of the control rabbits.

Table 4: Effect of *Caulis bambusae* stem extract on some Biochemical Parameters in chinchilla rabbits after 30 days of treatment

Parameter	Group 1	Group 2	Group 3
Treatment	Control	2.50ml, SECB	5.0ml, SECB
Glucose (mg/dl)	60.00 ± 0.19	62.00 ± 1.02	60.00 ± 1.04
Protein (mg/dl)	44.00 ± 1.41	49.50 ± 1.07	45.00 ± 1.10
Urea (mg/dl)	15.00 ± 1.03	13.50 ± 2.07	14.00 ± 1.20
Creatinine (mg/dl)	0.61 ± 0.41	0.65 ± 0.81	0.62 ± 0.62
AST (µl)	0.70 ± 0.12	0.70 ± 0.10	0.81 ± 0.11
ALT (µl)	0.40 ± 0.29	0.40 ± 0.59	0.49 ± 0.12
ALP (µl)	0.80 ± 0.10	0.70 ± 0.15	0.80 ± 1.20
ACP (µl)	4.00 ± 0.08	3.70 ± 0.19	4.10 ± 0.13

P> 0.05 for tests versus control

Table 5: Effect of *Caulis bambusae* stem extract on some Biochemical Parameters in chinchilla rabbits after 60 days of treatment

Parameter	Group 1	Group 2	Group 3
Treatment	Control	2.50ml, SECB	5.0ml, SECB
Glucose (mg/dl)	64.50 ± 0.17	68.00 ± 1.02	64.00 ± 2.11
Protein (mg/dl)	50.40 ± 0.20	51.00 ± 1.80	53.70 ± 1.95
Urea (mg/dl)	16.00 ± 0.60	16.20 ± 0.16	15.80 ± 0.70
Creatinine (mg/dl)	0.63 ± 0.11	0.69 ± 0.15	0.68 ± 0.30
AST (µl)	0.70 ± 0.10	0.72 ± 0.09	0.80 ± 0.10
ALT (µl)	0.65 ± 0.25	0.50 ± 0.32	0.55 ± 0.18
ALP (µl)	0.80 ± 0.11	0.75 ± 0.15	0.80 ± 0.11
ACP (µl)	4.20 ± 0.15	4.00 ± 0.16	4.40 ± 0.20

P> 0.05 for tests versus control

Table 6: Effect of *Caulis bambusae* stem extract on some Biochemical Parameters in chinchilla rabbits after 90 days of treatment

Parameter	Group 1	Group 2	Group 3
Treatment	Control	2.50ML SECB	5.0ml SECB
Glucose (mg/dl)	71.00 ± 0.17	75.00 ± 0.29	70.00 ± 1.00
Protein (mg/dl)	54.50 ± 1.07	54.00 ± 1.04	57.00 ± 1.04
Urea (mg/dl)	16.50 ± 2.12	15.80 ± 0.04	16.20 ± 0.30
Creatinine (mg/dl)	0.71 ± 0.10	0.74 ± 0.10	0.69 ± 0.01
AST (µl)	0.70 ± 0.11	0.75 ± 0.09	0.80 ± 0.12
ALT (µl)	0.70 ± 0.13	0.60 ± 0.19	0.80 ± 0.11
ALP (µl)	0.80 ± 0.10	0.80 ± 0.10	0.80 ± 0.12
ACP (µl)	4.50 ± 0.17	4.00 ± 0.20	4.40 ± 0.19

P> 0.05 for tests versus control

3.2.1 Effect of *Caulis bambusae* stem extract on the Lipid profile of rabbits

At the end of 30 days treatment with *Caulis bambusae* stem extract, there was significant elevations (P<0.05) in the levels of total serum cholesterol, triglycerides, high density lipoprotein cholesterol (HDL-C) and low density

lipoprotein cholesterol (LDL-C) when compared to the control (Table 7). The same trend continued after 60 days of treatment (Table 8). However, treatment up to 90 days produced no further significant changes in the lipid profile of the rabbits (Table 9).

Table 7: Effect of *Caulis bambusae* stem extract on the Lipid profile of rabbits after 30 days of treatment

Parameter	Group1	Group 2	Group 3
Treatment	Control	2.50ml, SECB	5.0ML, SECB
Total cholesterol (mg/dl)	75.00 ± 0.13	64.50 ± 0.08	68.40 ± 0.05
Triglycerides (mg/dl)	54.50 ± 0.04	54.50 ± 0.12	50.00 ± 0.14
HDL-C (mg/dl)	42.00 ± 0.16	40.00 ± 0.01	43.00 ± 1.04
LDL-C (mg/dl)	50.00 ± 0.20	50.50 ± 0.07	51.50 ± 0.07

Table 8: Effect of *Caulis bambusae* stem extract on the Lipid profile of rabbits after 60 days of treatment

Parameter	Group1	Group 2	Group 3
Treatment	Control	2.50ml, SECB	5.0ML, SECB
Total cholesterol (mg/dl)	83.80 ± 0.06	85.10 ± 0.09	79.30 ± 0.06
Triglycerides (mg/dl)	60.70 ± 0.05	58.30 ± 0.15	60.30 ± 0.05
HDL-C (mg/dl)	49.70 ± 0.05	50.30 ± 0.20	50.70 ± 0.05
LDL-C (mg/dl)	55.30 ± 0.10	55.70 ± 0.18	54.70 ± 0.08

Table 9: Effect of *Caulis bambusae* stem extract on the Lipid profile of rabbits after 90 days of treatment

Parameter	Group1	Group 2	Group 3
Treatment	Control	2.50ml, SECB	5.0ML, SECB
Total cholesterol (mg/dl)	97.50 ± 0.07	100.50 ± 0.07	100.40 ± 0.12
Triglycerides (mg/dl)	71.10 ± 1.40	70.00 ± 0.14	70.50 ± 0.07
HDL-C (mg/dl)	71.00 ± 1.20	60.00 ± 0.03	69.00 ± 0.80
LDL-C (mg/dl)	70.00 ± 1.10	70.00 ± 0.50	71.00 ± 0.60

**= P<0.05 for tests versus control*

DISCUSSION

Blood parameter analysis is relevant to risk evaluation as haematologica indices have higher predictive value for toxicity [15]. Anaemia following the administration of an agent can be as a result of lysis of red blood cells or inhibition of blood synthesis by the active constituent of the extract. Decrease in haematological parameters has been established in experimental animals to be strongly associated with anaemia[16]. There were no significant reductions in haematological following treatment *Caulis bambusae* stem extract. The RBC, Hb, PCV, MCV and MCH levels of the test rabbits were either higher or similar to those of control animals within the 90 days treatment and monitoring period, suggesting that there was no lysis of blood cells or inhibition of blood synthesis and imply that the phytochemical constituents in *Caulis bambusae* are present within tolerable limits. The observed increase in total WBC counts may be attributed to immune response of the rabbit to the extract.

The kidneys are responsible for eliminating drug metabolites and other biomolecules from the body and are most likely to be affected during systemic toxicity. The treated rabbits had glucose, protein, urea and creatinine levels which did not significantly differ from those of the control rabbits during the period of chronic toxicity study and suggest that the extract has no adverse effect on the kidney cells. Serum enzymes measurement is a valuable tool in clinical diagnosis because it provides information on the extent and nature of damage to any tissue. Therefore, increase in serum enzymes activity may indicate hepatic damage due to altered cell membrane permeability leading to the leakage of the enzymes from tissue to the serum and is an indicator of hepatocellular damage [17]. Result obtained support the non liver toxicity activity of *Caulis bambusae* stem extract, since the AST, ALT, ALP and ACP values fall within the normal range. Ibe, (1992) had reported that the preservation of normal liver activity is associated with normal AST, ALT, ALP and ACP values.

Increased total cholesterol, LDL-C and triglycerides (hyperlipidaemia) with decreased HDL-C values are risk factors for the development of cardiovascular diseases. Treatment with *Caulis bambusae* lowered lipid values in the treated animal and suggests that the extract may contain active principles with strong hypolipidaemic properties which may be of value in the alleviation of cardiovascular disorders. These results agree with [19] and [20], who reported that bamboo shavings exhibited strong antilipidaemic properties in experimental animals.

Conclusively, *Caulis bambusae* stem extract has being found to exert no adverse effect on the haematological and biochemical profile of treated chinchilla rabbits but with evidence of hypolipidaemic activity which could be of value in the management of cardiovascular problems.

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