

Full Length Research Paper

The effect of acute and chronic (short and long term) oral administrations of black pepper (*Piper guineense*) aqueous extract on the body weight and haematological values of albino-Wistar rat

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Black pepper seeds (144 g) were pounded with mortar and pestle and the powdered was wrapped in thumble and suspended into a soxhlet extractor. An appropriate volume of methanol (500 mls), as solvent was added into the receiver flask to three quarter full. The soxlet extractor was heated with thermostatic hot plate (72°C) for 72 h. The extracted sample in the solvent was evaporated using electrical evaporator for 24 h. Oral administration of the aqueous extract at a dose of 4 g/kg to the albino-Wistar rats, weighing between 120 and 180 g significantly increased their body weights. On the haematological values, the activity of *Piper guineense* increased the red blood cell (RBC) and white blood cell (WBC) counts, pack cell volume (PCV) and MCHC values, Hb concentration, with a reduction in MCH, MCHC and mean corpuscular value (MCV).

Key words: *Piper guineense*, hematological values, bodyweight, albino-Wistar rats.

INTRODUCTION

Natural medicine has been practiced from time immemorial for the treatment of ailments in Africa before the introduction of orthodox medicine. The use of herbs forms an important part of natural medical practiced in Nigeria and elsewhere. Excellent reviews by (Dalziel, 1970; Oliver-Bever, 1983) documented a list of medicinal plants used in West Africa for the treatment of a variety of disorders. (Yongabi, 2004) reported that, some part plants are used in the treatment of otitis media, boils and management of hypertension. Among these, is the black pepper (*Piper guineense*), which has recently become medically useful.

Black pepper is a climbing perennial plant belonging to the family Piperaceae. It is a spicy plant, whose fruits which contain pungent piperine provide essential oil used in the beverage and pharmaceutical industries (Burkhill, 1984; Rehn and Espig, 1991). The pungency of the

pepper is due to the presence of resins particularly chavicine and yellow alkaloid in the fruits. Piperine contains forms 5 - 8% of the weight of black pepper (Rehn and Espig, 1991; Lale, 1992). The dried fruits of *P. guineense* is usually ground and used as spice in food (Dalziel, 1970). In the North, East and Western parts of Nigeria, *P. guineense* is called "MASORO", "UZIZA" and "YEERE" respectively. Among these ethnic groups, black pepper is used as flavor and additionally for the treatment of pile and dysentery, conception in women and expulsion of fetal membranes after delivery or abortion. This study is aimed at investigating the short and long term oral administrations aqueous extract of *P. guineense* on the body weight and haematological values of the albino-Wistar rats.

MATERIALS AND METHODS

Plant extract

Clean and well dried seeds of *P. guineense* (black pepper) were

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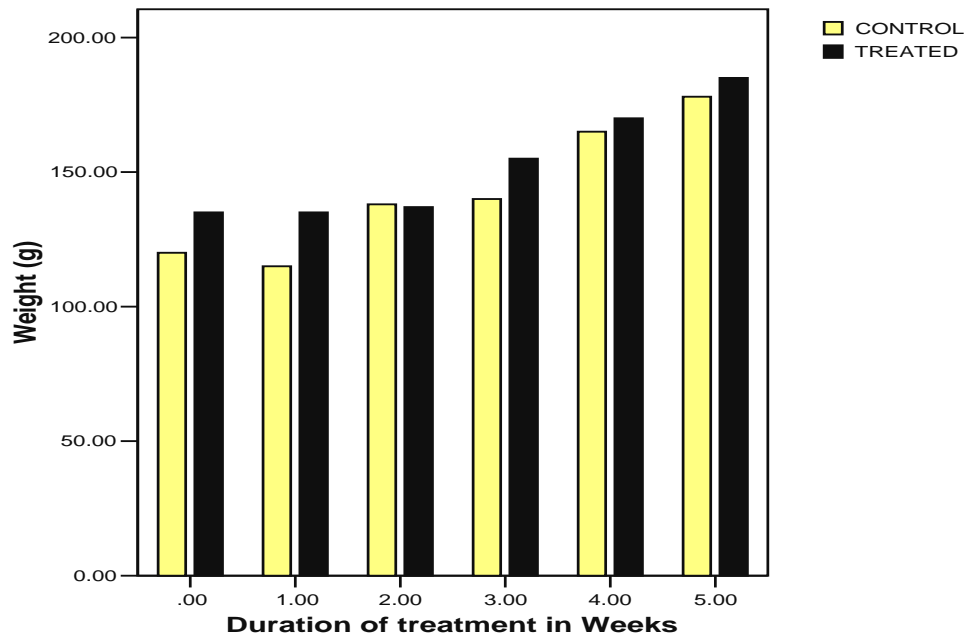


Figure 1. A histogram presenting changes in body weight of control (un-treated) and treated rats following short and long term oral administrations of *P. guineense*.

bought from Lafia main market of Nasarawa state, Nigeria. The seeds were pounded to a fine powdery form using a wooden mortar and pestle. A 100 g of the powdered *P. guineense* was rapped in thimble and suspended into the soxhlet extractor and an appropriate volume of distilled water (500 mls) as a solvent was added into the receiver's flask up to $\frac{3}{4}$ full. The soxhlet extractor was assembled and air condition maintained at all joints to prevent leakage of the vapors. It was thereafter heated with thermostatic hot plate at 100°C for 72 h. The liquid extract obtained was concentrated in a vacuum at 40°C and later stored in a refrigerator at 4°C until used for this experiment as described by Okokon et al. (2004).

Study site

The experiment was conducted in the anatomy and physiology laboratory of the College of Agriculture, Lafia, Nasarawa state. Meteorological data during the period of this experiment were temperature 27 - 32°C and average relative humidity of 76%.

Experimental animals and procedure

Twenty (20) young albino-Wistar rats weighing between 120 and 180 g were used in this study. They were purchased from Vom in Jos, Plateau State, Nigeria and kept in standard cages for 2 weeks to adapt to the new environment with feed and water supplied *ad libitum*. A concentration of 0.1-1 g/ml of *P. guineense* stock was prepared and a calculated dose of 4 g/kg body weight of the albino-Wistar rats was administered orally once daily for a period of 5 weeks. The body weights of the experimental rats were taken daily. At a weekly interval, three experimental rats were anaesthetized with chloroform vapor and dissected. Whole blood was obtained by cardiac puncture from each rat and collected into anticoagulant treated (EDTA 0.77M) sterile bottles. The blood samples were used for the determination of red blood cell count (RBC), white blood cell

count (WBC) and Haemoglobin concentration. Packed cell volume (PCV) was estimated using micro-haematocrit method as described by (Alexander and Griffiths, 1993a) and haemoglobin concentration (Hb) was determined using cynomethaemoglobin as described by (Alexander and Griffiths 1993b); whereas the RBC and WBC counts were estimated by visual means using the new improved Neubauer counting chamber as reported by (Dacie and Lewis, 1991).

The calculations of red blood cell values were done as described by (Jain, 1986):

Mean corpuscular volume (MCV) = $PCV \times 10 / RBC$ (fl).

Mean corpuscular haemoglobin (MCH) = $Hb \times 10 / RBC$ (pg).

Mean corpuscular haemoglobin concentration (MCHC) = $Hb \ 100 / PCV$.

Statistical analysis

The data obtained were statistically analyzed using SPSS student version 12.0 for windows.

RESULTS

Body weight

The present study revealed several important characteristics of aqueous extracts of *P. guineense*. The results of the effects of short and long term administrations of *P. guineense* on the body weight of albino-Wistar rats showed significant increase from "week 1" to "week 5", but a higher value for the treated rats from "week 3 to "week 5" (Figure 1).

Table 1. Hematological values of treated and un-treated (control) albino-Wistar rats with *P. guineense*.

Haematological Values	RBC ($\times 10^2 \mu\text{l}$)	WBC ($\times 10^3 \mu\text{l}$)	HB (g/dl)	PCV (%)	MCV (μm^3)	MCH (pg)	MCHC (%)
Control							
Rats	5.0 \pm 1.4	4.3 \pm 0.6	12 \pm 2.0	38.9 \pm 2.5	77 \pm 0.0	24 \pm 3.0	30.8 \pm 1.0
Week 1							
Rats	5.4 \pm 0.6	4.7 \pm 0.1	12.2 \pm 0.4	39.2 \pm 5.3	78.4 \pm 1.1	24.4 \pm 5.5	31.1 \pm 0.8
Week 2							
Rats	5.4 \pm 0.5	4.9 \pm 0.1	12.5 \pm 0.8	40 \pm 2.5	74 \pm 0.7	23.2 \pm 5.0	31.3 \pm 1.2
Week 3							
Rats	5.7 \pm 0.2	5.4 \pm 5.0	12.6 \pm 0.4	41.5 \pm 4.9	72.8 \pm 0.7	22.1 \pm 2.0	30.5 \pm 0.7
Week 4							
Rats	5.9 \pm 2.0	5.4 \pm 2.0	12.8 \pm 0.8	42 \pm 4.8	71.2 \pm 0.6	21.7 \pm 4.0	30.5 \pm 0.0
Week 5							
Rats	6.0 \pm 0.4	5.8 \pm 1.0	16.5 \pm 0.0	42.5 \pm 2.5	70.8 \pm 0.3	27.5 \pm 1.0	38.8 \pm 3.0

Hematological values

The red blood cell count of treated rats with *P. guineense* (week 1 and 2,) with the values 5.4 \pm 0.6, 5.4 \pm 0.5, showed no significant increase, but an increase in week 3, 4 and 5 (5.7 \pm 0.2, 5.9 \pm 2.0 and 6.0 \pm 0.4) compared to the control (un-treated rats) (5.0 \pm 1.4). The white blood cell count of treated rat from week 1 to week 5 with the values 4.7 \pm 0.1, 4.9 \pm 0.1, 5.4 \pm 5.0, 5.4 \pm 2.0 and 5.8 \pm 1.0 showed an increase compared to the control (4.3 \pm 0.6) (Table 1). The haemoglobin concentration of the treated rats with *P. guineense* week 1 to 4 (12.2 \pm 0.4, 12.5 \pm 0.8, 12.6 \pm 0.4 and 12.8 \pm 0.8) showed no significant difference compared to the control (12 \pm 2.0) while week 5 (16.5 \pm 0.0) showed a significant increase (Table 1). The packed cell volume of the treated rats from week 1 to 5 with values 39.2 \pm 5.3, 40 \pm 2.5, 41.5 \pm 4.9, 42 \pm 4.8 and 42.5 \pm 2.5 showed a rapid increase compared to the control (38.9 \pm 2.5).

The calculated values of mean corpuscular value (MCV) showed a decreased from week 2, 3, 4 and 5 of the treated *P. guineense* with the values 74 \pm 0.7, 72.8 \pm 0.7, 71.2 \pm 0.6 and 70.8 \pm 0.3 compared to the control and week 1 with the values as 77 \pm 0.0 and 78.4 \pm 1.1 respectively, (Table 1). For treated rats with *P. guineense* week 2 to 4, the MCH values of 23.2 \pm 5.0, 22.1 \pm 2.0 and 21.7 \pm 4.0 decreased compared to control and week 1 (24 \pm 3.0 and 24.4 \pm 5.5) and week 5 with value of 27.5 \pm 1.0 which is higher. There was a significant ($P < 0.05$) decreased in week 3 and 4 (30.5 \pm 0.7 and 30.5 \pm 0.0) and a significant increase in week 1, 2 and 5 (31.1 \pm 0.8, 31.3 \pm 1.2 and 38.8 \pm 3.0) of the treated *P. guineense*

compared to the control with value of 30.8 \pm 1.0.

DISCUSSION

The short and long term oral administration of aqueous extract of *P. guineense* showed a significant increase in the body weight of the treated rats at the five weeks period. This finding was in line with the result of Mbongue et al. (2005) who reported a significant increase in the body weight of rats treated with *P. guineense* after 55 days. The increase in the body weight of *P. guineense* treated rats could be due to the androgenic properties of in black pepper which possess anabolic activity (Mbongue et al., 2005). The results obtained from the short and long term administration of *P. guineense* on the haematological values showed that the extract of *P. guineense* increased the values of RBC, WBC, PCV and MCHC. However, the increase in haematological values was dependent on the duration of treatment, which is contrary to the report of Okokon et al. (2004), who reported a decrease in the haematological values due to anaemic condition.

The committee for orphan medicinal products, European Medicines Agency (2005) reported that the decrease in RBC involves the polymerization (molecules joining together into a chain) of haemoglobin S. They further stated that *P. guineense* seeds could block (inhibit) the polymerization of this haemoglobin S and might therefore reduce the number of sickle cells in the blood. There was a decrease in MCV and MCH of the treated *P. guineense* which is in line with the report of Keele et al. (1983) who stated that normocytic and hypochromic

anaemia results when there is a reduction in MCH or MCHC. There was no significant difference ($P > 0.05$) in the Hb values. (Sandberg and Bruhn, 1979) reported that, most of the activity of the crude extract preparation obtained from *P. guineense* is due to another substance, possibly a peptide. However, the activity of the aqueous extract of *P. guineense* was attributed to oxytocin and acetylcholine.

Conclusion

In conclusion, the significant increase in the body weight of the treated rats at 5 weeks period could be due to the androgenic properties of the androgens which possess anabolic activity of *P. guineense* extract. These results explained the traditional use of the plant, as adjuvant to many other medicinal plants, flavor in food and for treatment of patient suffering from pile and dysentery, improving the nursing mother's chance of conception and expulsion of placenta after delivery or abortion of fetus during early pregnancy.

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