



Evaluation of Associated Changes on Haematological Profile of Wistar Rats Fed *Curcuma longa* (Turmeric) Rhizome Powder

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Authors' contributions

This work was carried out in collaboration among all authors. Author AVI designed the study, authors ECC and JAN performed the laboratory experiments and the statistical analysis. Authors AVI and JNE wrote the protocol, the first draft of the manuscript. Authors AVI and ECC managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Turmeric spice has a diverse array of biological activities. The present study evaluated body weight and haematological impact of *Curcuma longa* (Turmeric) in male albino rats using standard analytical methods. Twenty four healthy male albino rats were used for the study. Results shows no significant increase in body weight in the first week of dieting while a gradual increase was observed with increasing weeks of dieting. Treatment with the powder did not significantly ($P \geq 0.05$) alter the levels of hemoglobin (Hb), red blood cells (RBC) and means corpuscular volume (MCV) of the rats. The result also showed a significant ($p \leq 0.05$) increase in the platelets and mean corpuscular hemoglobin concentrations (MCHC). However, the white blood cells (WBC) and the packed cell volume (PCV) concentrations were slightly reduced. This study

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suggests that adding *Curcuma longa* (Turmeric) at 50, 100, 200 mg/kg body weight within the duration of study could positively affect the hematological parameters and general well being of the body.

Keywords: Haematological; rhizome powder; evaluation; *Curcuma longa*.

1. INTRODUCTION

Curcuma longa (Turmeric) is a plant in the Zingiberaceae family that has been in use in most parts of Nigeria as dietary spice, colouring agent and in traditional treatment of diseases. The plant is widely distributed in warm areas of Asia, Africa, and South America. Nutritionally, turmeric powder contains of 6.3% protein, 5.1 % lipid, 3.5% mineral, 69.4% carbohydrate, 13.1% moisture and 5% curcuminoids, 50-60% of which are a mixture of curcumin (diferuloylmethane), monodesmethoxy curcumin and bis desmethoxy curcumin [1,2,3]. Turmeric is claimed to be effective in so m many diseases such as treatment of sun exposure induced skin-aging, increased thickness and reduction in elasticity of skin, skin injury [4]. The present study is aimed at evaluating the impact of turmeric powder on body weight as well as haematological indices using male albino rats.

2. MATERIALS AND METHODS

2.1 Plant Collection

Turmeric (*Curcuma longa*) powder (500 g) which was processed after harvest by the Crop Science Department of the Imo State Polytechnic, Umuagwo- Owerri; was purchased from the Departmental shop. The powder was stored in an air tight container at room temperature.

2.2 Animals

Twenty four healthy weaned four weeks old male albino rats of comparable weights were procured from the Faculty of Veterinary Medicine, University of Nigeria Nsukka. Upon arrival the animals were acclimatized for 7 days with free access to water and commercial pellets of growers mash produced by Guinea Mill Plc, Ibadan – Nigeria.

2.3 Experimental Design

The rats were randomly divided into four groups of six animals each. Group A served as the normal control receiving distilled water only, while groups B, C and D received distilled water and the Turmeric powder solubilized in distilled

water (50, 100, 200 mg/kg body weight) respectively once daily for 3 weeks. All the administrations were given intragastrically using an intubator. All the animals were weighed on the first day and thereafter weekly till the end of the experiment.

2.4 Collection of Blood Samples/ Determination of Haematological Indices

At the end of the experiment the animals were sacrificed and blood samples collected through the orbital sinus of the eyes into EDTA tubes and centrifuged at 3000 rpm for 10 min; for the assessment of haematological parameters. Packed cell volume (PCV) and haemoglobin (Hb) concentration were determined by the conventional method of Ekaidem *et al.* [5]. Erythrocyte count, total leucocytes and leucocytes differential counts were determined as described by Coles [6]. Erythrocyte indices – mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC) and mean corpuscular haemoglobin (MCH) were determined from values obtained from RBC count, haemoglobin concentration and PCV values using the method of Ekaidem *et al.* [5].

2.5 Statistical Analysis

Results were expressed as mean \pm standard deviation (S.D). The data were subjected to one-way analysis of variance (ANOVA) and differences between means were calculated using student-t test and considered significant if $p \leq 0.05$.

3. RESULTS AND DISCUSSION

There was a progressive and significant ($p \leq 0.05$) increase in the body weight of all the treated rats (Table 1).The progressive increase in the body weight may be as a result of high nutrient composition of turmeric. Since extreme retrogressive changes in body weight have been used as an indicator of adverse effects of drugs and chemicals (Theo *et al.*, 2002), our results therefore suggest that oral doses of turmeric powder administered for 21 days did not elicit

Table 1. Effect of graded doses of *C. longa* powder on body weight of rats \pm S.D (n = 6)

Body weights	Group A	Group B	Group C	Group D
Week one	55.2 \pm 5.81*	50.38 \pm 3.16*	50.28 \pm 5.36*	53.52 \pm 5.24*
Week two	101.29 \pm 13.96	94.78 \pm 12.55	94.78 \pm 12.55	99.90 \pm 15.26
Week three	126.61 \pm 22.26	136.99 \pm 13.12	136.74 \pm 29.5	132.43 \pm 35.76

Values are mean \pm standard deviation. Means in the same row having * are statistically different

Table 2. Effect of graded doses of *C. longa* powder on hematological parameters of rats (n = 6)

Parameters	Group A (Control)	Group B (50 mg/kg)	Group C (100 mg/kg)	Group D (200 mg/kg)
HGB (mg/l)	113.8 \pm 19.13*	115.8 \pm 22.23*	111.4 \pm 17.32*	113.6 \pm 14.38*
RBC ($\times 10^{12}/l$)	6.39 \pm 1.05*	6.52 \pm 1.28*	6.09 \pm 0.86*	6.07 \pm 0.90*
HCT (PCV)(%)	30.56 \pm 1.67	26.62 \pm 5.19	26.46 \pm 4.98	19.68 \pm 10.85
MCV (fL)	44.7 \pm 2.42	40.88 \pm 2.37*	43.24 \pm 2.77	40.45 \pm 1.58*
MCH (pg)	17.74 \pm 0.89	17.68 \pm 0.75	18.18 \pm 0.6	17.63 \pm 0.93
MCHC (g/l)	399 \pm 14.49	435.2 \pm 8.77	423.6 \pm 24.05	440.75 \pm 6.02
PLATELETS ($\times 10^9/l$)	429 \pm 223.90	1100.25 \pm 697.93	483.8 \pm 482.69	673.25 \pm 795.26
WBC ($\times 10^9/l$)	16.3 \pm 2.86	8.82 \pm 3.73	10.63 \pm 1.66	12.6 \pm 7.59

Values are mean \pm standard deviation. MTableeans in the same row having * are not statistically different

any toxic response. However, during the third week there was a significant increase in the mean body weight of the animals which may be attributed to administration of the turmeric powder.

3.1 Discussion

Body weight gain in experimental animals exposed to diet formula is attributed to high nutritional value of the food, digestion and acceptability of the diet by animals as well as presence of non toxic compounds in the food. Results suggest no significant increase in body weight in the first week of dieting while a gradual increase in body weight of rats was recorded as the weeks of administration increases. This slight increase in body weight may have resulted from natural growth or increase in food intake as a result of acceptability of the tumeric powder as well as activation of nutrient absorption by the bioactive compounds contained in *Curcuma longa* (turmeric). The presence of viable bioactive compounds that are needed for growth and body repair may have contributed to efficacy of turmeric powder. These organic active substances may have impact on the improvement of stomach environment as well as boost the immune system of the experimental animals. The results of the present study is in accordance with the report of Mehala [7] who observed non significant increase in body weight by adding different levels of turmeric at the first weeks and also agrees with Al-Sultan [8] who posited slight increase in weight with

increasing weeks of dieting. Several researchers have posited the useful impact of dietary turmeric on growth performance and feed efficiency ratio as well as none adverse effect on mortality [8,9]. This finding suggest that intake *Curcuma longa* (Turmeric) at different concentration within the duration of study may improve metabolic status through balancing of basal metabolic rate, which may in turn cause increased energy intake.

Haematology involves the study of morphology of the cellular elements of the blood that are used in investigation of the extent of damage to blood and physiological status of experimental animals. Hematological analysis gives insight into cellular damages resulting from stresses due to environmental, nutritional and pathological factors [10,11]. Blood constituents change in relation to physiological conditions of health and these changes are diagnostically important in routine clinical evaluation of the state of health [12,13]. Result of the present study shows a non-significant increase in hemoglobin level. This indicates that turmeric powder does not contained toxic substances that stimulate the production of haematopoietin, a glycoprotein hormone that controls erythropoiesis. Akubugwu and Duru [14] posited that presence of toxicants in food triggers haematopoietin synthesis. The significant decrease observed in PCV in test rats against those of the control rats is normal considering the non significant increase in haemoglobin (Hb). The significant decrease observed in WBC counts of the test rats on

dieting on turmeric powder compared to control showed that the sample does not contain toxic substances that may alter normal physiological processes. According to Akubugwu and Duru [14], when toxic substances are introduced into an organism, antibodies are produced in response to the antigen as WBCs are the main source of lysozyme synthesis and phagocytic activity. This finding suggests that adding turmeric powder has the potency to maintain immune system. The constant ratio of MCH and MCHC showed that experimental animals fed with tumeric powder showed a healthy response. Similar finding have also been reported by Sivagurunathan et al.,[5]. The significant reduction in MCV in the treated groups relative to control is an insight into the efficacy of turmeric powder to increase the potentials of the experimental animals toward diseases as MCV have been reported to cause quicker movement of blood, which prevents red blood cell sedimentation as well as blood coagulation [1].

4. CONCLUSION

In conclusion addition of turmeric powder in the diet positively affected the hematological parameters as well as general body well being.

ETHICAL APPROVAL

Animal Ethic committee approval has been taken to carry out this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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