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Research Article

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In vivo studies of *Solanum aethiopicum* fruit on some biochemical parameters using rats

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ABSTRACT

In vivo studies of Solanum aethiopicum fruit on some biochemical parameters using rats were carried out. Thirty-two wister albino rats were allocated to four groups of eight rats each. One group served as the control while the rest served as test groups. The test rats were placed on compounded feed of dried and ground Solanum aethiopicum fruit and pelletized rat feed using different proportions. Results obtained showed that Solanum aethiopicum fruit had significant effect ($p>0.05$) on some biochemical parameters investigated in test rats when compared to those of the control. This study has shown the In vivo studies of Solanum aethiopicum fruit on some biochemical parameters using rats.

Keywords: Biochemical parameters, Mkpuruofe, *Solanum aethiopicum*, vegetables.

INTRODUCTION

Vegetable are widely grown in parts of the world due to their importance [1]. They constitute the most affordable as well as sustainable source of macro and micro nutrients in diets [2]. Vegetables are known to beef up poor diets in terms of nutrients [3].Fruits from vegetables are also of immense importance [4]. They contribute to digestion and are used for therapeutic purpose. Fruits play significant role in folk medicines in some continents of the world such as Asia, Africa, and South America. In Nigeria both those that depend on folk or orthodox medicine believe in the nutritional and protective functions of fruits [5-7].

Solanum aethiopicum fruit commonly known as garden egg among Nigerians from *Solanaceae*family is among such fruits consumed with believe in its nutritional or protective functions. The fruit is known locally as “Aṅara” “Afufa” or “Mkpuruofe” by the Igbo tribe of South-eastern, Nigeria and is consumed in all part of Nigeria [8].

Sequel to the high rate of consumption of this fruit among Nigerian populace, it becomes important to investigate its possible effect on some biochemical parameters.

The present study looked into this area of study with a view to inform the people as the case may be.

EXPERIMENTAL SECTION

Sample collection and preparation: The *Solanum aethiopicum* fruit samples used in the present study were purchased from a farm within Owerri Municipal, Imo State, Nigeria .The samples were properly identified by Dr. F. N. Mbagwu of Plant Science and Biotechnology Department, Imo State University, Owerri, Nigeria. The identified

fruits were air dried for seven days and ground into powder using simple electric blender. The ground sample was compounded with animal feed to form the rat feed of test rats' in the present study.

Experimental animals and design: A total of forty (40) male Wistar albino rats weighing between 90-110g were purchased from the animal colony of Department of Biochemistry, Abia State University, Uturu, Abia State, Nigeria and kept in standard cages for 4 days to enable them acclimatize to their new environment. Pelletized commercial rat feed (Pfizer livestock Co. ltd, Aba, Nigeria) and sachet water (Marlin purified water, Owerri, Imo State, Nigeria) were given to the rats *ad libitum* within this period. After acclimatization period, the rats were allocated to 5 groups of 8 rats each, and their weights were equalized as nearly as possible. Aside the control group, compounded feeds were given to the rats after allocation. The feeds for the different groups were compounded as follows:

Control group = Normal feed + sachet water; Group I_a = 5% fruit sample + 95% pelletized feed + sachet water, Group I_b = 10% fruit sample + 90 % pelletized feed + sachet water; Group $_{Ic}$ = 15% fruit sample + 85% pelletized feed + sachet water; and Group I_d = 20% fruit sample + 80% pelletized feed + sachet water.

The treatment of experimental animals was in accordance to the National Institute of Health (NIH) guidelines for the care and use of laboratory animals [9].

Blood sample collection: At the end of the feed and water administration periods (40 days), rats from the various groups were weighed and sacrificed after being put to sleep in a closed container with chloroform. Blood was collected by direct cardiac puncture into heparin treated tubes. The tubes were properly labelled and used for analyses.

Hematologic test: Blood percentage (Hb) and RBC levels were determined using Sahi`s methods respectively [10]. Westergreen`s method was used for erythrocyte sedimentation rate (ESR), counting chamber and slide methods were used for white blood cell total count (WBC Total) and differential counts respectively. Haematocrit method was used for packed cell volume (PCV) whereas, mean corpuscular volume (MCV),mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC), were determined as described by [11].

Serum assay

The method of [12] was used to determine alkaline phosphatase (ALP), alanine aminotransferase (ALT), and aspartate aminotransferase (AST) levels were determined using the methods of [13]. Total and conjugated bilirubin levels were assayed using [14] methods. Creatinine, urea, and potassium ion were determined following strictly the instructions on their kits. Sodium ion, chloride and bicarbonate ions of renal function were done using the methods of [5],[16] and[17] respectively.

RESULTS AND CONCLUSION

Table 1: Haematology of rats given *Solanum aethiopicum* fruit for 40 days

Group / Parameters	Control	I_a	I_b	I_c	I_d
Hb (g/dl)	14.13±0.06	15.08±0.15	15.74±0.38	15.98±0.11	15.93±0.10
PCV (%)	42.40± 1.03	45.27± 0.98*	47.21± 1.01*	47.99±0.38*	47.81±0.80*
WBC (10^9/L)	8.09±0.76	11.15±1.07*	13.16±1.23*	13.60±1.05*	13.74±1.11*
Lymphocyte (%)	63.02±0.10	67.10±0.09*	67.21±0.06*	67.40±0.11*	67.01±0.17*
Eosinophil (%)	0.51±0.03	0.55±0.01	0.54±0.06	0.57±0.09	0.58±0.05
Monocyte (%)	0.40±0.01	0.42±0.03	0.44±0.02	0.46±0.01	0.44±0.03
Basophil (%)	0.80±0.04	0.84±0.06	0.82±0.03	0.82± 0.07	0.86±0.05
MCH (pg)	4.12±0.20	4.09±0.16	4.15±0.11	4.05±0.33	4.37±0.17
MCHC (g/dl)	0.37±0.08	0.32±0.05	3.27±0.09	3.91±0.04	3.10±0.01
ESR (mm/hr)	6.15±0.11	6.19±0.32	6.33±0.12	6.34±0.40	6.45±0.53

Results are mean and standard deviation of eight determinations. Values asterisked are statistically significant against the control ($p<0.05$).

Assessment of haematological parameters is very useful in evaluating the blood relation functions of substance that enter the biological system of animals. Rats placed on *Solanum aethiopicum* fruit had insignificant ($p>0.05$) but apparent increase in Hb levels when compared to those of the control (Table 1). The significant increase ($p<0.05$) observed in PCV of test rats in this study against those of the control is normal in with increase in Hb in a biological system [18]. When immune system is stimulated by a foreign body, WBC is normally released as physiological reaction to protect the body [19]. This could be the cause of the significant increase ($p<0.05$) observed in WBC of test rats when compared to those of the control in the present study. Celik and Suzek[20] noted that leucocytosis

may be directly related to the severity of the causative stress condition. The studied fruit significantly increased ($p<0.05$) lymphocytes in test rats but could not affect eosinophil, monocyte and basophil in test rats when compared to those of the control rats. Adebayo *et al*., [21] and Adebayo *et al*., [22] noted that MCHC and MCH are related to individual red blood cells. Both MCH and MCHC of test rats were insignificantly affected ($p>0.05$) when compared to those of the control rats. This could be indication that red blood cells of rats placed on *Solanum aethiopicum* fruit were not affected when compared to those of the control. The increase observed in some investigated blood parameters could not affect the rate of sedimentation of the blood cells hence, the levels of erythrocyte sedimentation rate (ESR) of test rats were insignificantly affected ($p>0.05$) when compared to those of the control.

Table 2.Hepatic function of rats given *Solanum aethiopicum* fruit for 40 days

Group / Parameter	Control	I_a	I_b	I_c	I_d
ALP (U/L)	27.19±1.07	27.21±1.10	27.38±1.20	27.29±1.17	27.45±1.95
AST(U/L)	60.53± 0.11	61.05.± 0.15	61.07± 0.10	61.10±0.82	61.18±0.13
ALT(U/L)	37.02±0.18	37.13±0.21	37.28±0.20	37.39±0.37	37.50±0.44
Total bilirubin(mg/dl)	0.45±0.01	0.45±0.09	0.45±0.03	0.46±0.01	0.46±0.09
Direct bilirubin(mg/dl)	0.32±0.06	0.33±0.02	0.34±0.09	0.34±0.03	0.34±0.07

Results are mean and standard deviation of eight determinations.

The liver destroys harmful substances, secretes bile into the intestine, stores and produces certain important biomolecule [23-24]. The integrity of the liver and its cells are evaluated with hepatic function studies.Different authors [25-26] have noted that AST and ALT are both excellent markers of liver damage when exposed to toxicity. Serum levels ofalkaline phosphatase (ALP), aspartate aminotransferase (AST) and alanine aminotransferase (ALT) are affected by primary and secondary diseases such as the tumours, etc[27] ALP, AST and ALT levels of test rats in this study were insignificantly affected ($p>0.05$) when compared to those of the control. It therefore implies that the studied fruit did not affect the hepatocellular cells. Bilirubin is associated to protein breakdown in the system. Total and direct bilirubin in the present study were not affected ($p>0.05$) in test rats when compared to those of the control. It could be that consumption of *Solanum aethiopicum* fruit may not be associated with certain diseases that result in the body due to bilirubin problem.

Table 3.Renal function of rats given *Solanum aethiopicum* fruit for 40 days

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Groups / Parameter	Control	I_a	I_b	I_c	I_d
Creatinine (mg/dl)	0.63±0.03	0.64±0.01	0.64±0.06	0.64±0.03	0.64±0.07
Urea (mg/dl)	47.08± 1.10	47.36± 1.04	47.40± 1.11	47.46±1.17	47.58±1.39
K^+ (mEq/L)	5.10±0.19	5.14±0.23	5.16±0.18	5.18±0.29	5.30±0.40
Na^+ (mEq/L)	140.93±0.63	141.02±0.91	141.18±0.54	142.03±0.36	142.17±0.75
Cl^-(mEq/L))	97.08±0.20	97.26±0.29	97.53±0.13	97.65±0.40	98.06±0.11
HCO_3^- (mmol/L)	29.18±1.09	29.27±1.10	29.31±1.05	30.39±0.82	30.52±1.08

Results are mean and standard deviation of eight determinations.

The renal organ helps in maintain homeostasis and excreting waste products [28-31]. Urea is the main end product of protein catabolism. Urea represents about 90% of total urinary nitrogen excretion. Renal disturbances that lead to diminished glomerular filtrate may lead to urea accumulation which may affect urea cycle and hence affect the renal organ. Creatinine is a waste product of the muscle by creatine metabolism. Its retention in the renal organ is an impairment of renal function. The levels of creatinine and urea in this study were insignificantly affected ($p>0.05$) in test rats against those of the control. This may signify normal functioning of the renal organ. K^+, Na^+, Cl^- and HCO_3^- are termed electrolyte ions of the renal function. Problems that affect their excretion by the tubules of the renal organ could lead to renal function impairment[24].Their levels in the present study were insignificantly ($p>0.05$) affected in test rats against those of the control. This may imply that the fruit of study has no effect on the electrolyte ions of rats as observed in the present study.

CONCLUSION

This study has shown the*In vivo* studies of *Solanum aethiopicum* fruit on some biochemical parameters using rats. The implication of this study could be that those that consume this fruit may be exposed to these effects though the observed effects are not harmful observations.

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