EFFECTS OF CONSUMPTION OF MATURED AND UNRIPE *Carica papaya* ON MALONDIALDEHYDE, PACKED CELL VOLUME AND ORGAN FUNCTIONS IN RATS

[1]Anthony Ehigiamusoe Osaremhen
[1]Iyawe Hanson
[1]Department of Biochemistry, Faculty of Life Sciences,
Ambrose Alli University Ekpoma, Nigeria.
*Corresponding author contact: *ehigiamuose.anthony@aauekpoma.edu.ng*

ABSTRACT
Carica papaya, is a member of the Caricaceae family, widely known as pawpaw in Nigeria and is widely used in traditional medicine to treat various ailments. However, there is limited information about the effects of consuming both ripe and unripe pawpaw fruit. This study aims to evaluate the impact of unripe Carica papaya consumption on MDA levels, PCV, and liver and kidney enzyme functions in rats. The study involved feeding three groups of six albino rats with a diet containing 20% unripe papaya mixed in grower's marsh, while a control group received standard feed for 28 days, with body weight monitored throughout. After the feeding period, samples were collected and analyzed using standard procedures. The results indicated a significant difference ($p>0.05$) increase in weight across all groups. Proximate analysis of test samples ranged as follows. Carbohydrate content 21. 20 ± 0.92 to 20.15±0.27, dry matter content from 33.39 ±5.45 to 25.52±7.85, protein content from 1.91±0.04 to 2.19±0.02, Fat content from 0.99±0.03 to 1.30±0.03, fibre content from 11.77±0.03 to 12.61±0.02, moisture content 7.61±0,85 to 8.15±0.17 and ash content from 7.51±0.02 to 8.53±0.03 respectively. Among the different group of feeds administered to rats, the peeled samples showed significant ability to reduce both ALT/AST activity as well as urea concentration. While the steamed unpeeled sample, showed significant ability to reduce creatinine and MDA concentration along with GGT activity. Conclusively, the results obtained from the various assays, implies that both the peeled and steamed sample of mature unripe *Carica papaya* has been found to be effective in reducing oxidative stress and promoting improvement in such conditions. of both hepatic and renal functions in rats.

Keywords: *Carica papaya,* pawpaw, rats, oxidative stress, renal functions in rats, kidney enzyme functions in rats

1. INTRODUCTION
Carica papaya, often called papaya or pawpaw, is part of the Caricaceae family (Watson, 1997). Native to southern Mexico and northern South America, papaya is now extensively grown in tropical areas such as Malaysia, the West Indies, the Philippines, Sri Lanka, India, Bangladesh, and across Africa. Papaya plants can be monoecious, meaning they produce both male and female flowers (Sofowa, 1996). In some instances, male or hermaphroditic plants can switch to female after being cut. Despite its tree-like appearance, papaya is actually a herbaceous fleshy plant with an upright stem (Dick Gross, 2003).

Research has shown that papaya fruit extract may have potential health benefits in treating various diseases. However, there is limited data on the effects of consuming the whole fruit, particularly its influence on serum profiles, antioxidants, and liver and kidney functions (Oduola *et al*., 2007). Serum urea and creatinine are important markers of kidney function, and elevated levels may

indicate kidney damage (Gutteridge, 1980). Although some studies have explored the protective effects of papaya extracts, there is no animal or clinical data on the impact of unripe papaya on liver and kidney functions (Imaga *et al*., 2009). Antioxidants play a critical role in defending cells against free radical damage, helping to prevent diseases like cancer and kidney disorders. However, there is no research available on whether unripe papaya boosts antioxidant levels (Josiah *et al*., 2011). In Nigeria, unripe papaya is not commonly consumed, and its potential protective effects against diseases are still unknown. The aim of this study is to assess the impact of unripe papaya consumption on packed cell volume (PCV), malondialdehyde (MDA), and certain organ function enzymes in rats.

2. MATERIALS AND METHODS

2.1 Animals

Female albino rats, eighteen in number and aged 5 to 7 weeks and weighing between 62.30 and 86.90 grams, were acquired for the study. The rats were sourced from the animal facility of the Anatomy Department at the University of Benin, Nigeria.

- **Grower's Marsh (Feeds)**

The feeds (grower's marsh) were obtained from Ekpoma, Edo state

- **Experimental Design**

The feeds (grower's marsh) were obtained and used to modify carica papaya fruit samples obtained from Ambrose Alli. Ekpoma were modified on an 80.20 feed-meal basis of grower's marsh and *Carica papaya* respectively.

2.2 Preparation of Feed Blend Samples

Fresh mature unripe *Carica papaya* (pawpaw) fruits were obtained from the same plant in Ambrose Alli University, Ekpoma, Nigeria. The fruits were cut opened in other to remove the seeds and they were washed with distilled water to reduce any contaminating bacteria and other microorganisms and then sundried .The fruits obtained were separated into three groups, the peeled, unpeeled sundried and steamed *Carica papaya*. The steamed *Carica papaya* was steamed for 30 mins and oven dried at 60 degree Celsius and then blended into coarse form which was used to modify the feed (milled and meal and grower's marsh) that was used to feed the experimental animal

2.3 Blood Sample Collection.

The rats were fed for 28 days and were subjected to an overnight fast and then anesthetized with chloroform. Blood samples were drawn from each rat through cardiac puncture using sterile syringes and needles following dissection. The blood was collected in plain specimen bottles, then centrifuged for 10 minutes at 3000 rpm to separate the serum for collection.

2.4 Principles and Procedures

The extimation of total protein, Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), Bilirubin Liver, Albumin, Gamma Glutamyltransaminase (γ-GT), lipid Peroxidation, Creatinine estimation, Urea Estimation, Packed Cell Volume Analysis was carried out spectrophotometrically, using standard laboratory procedures.

2.5 Statistical Analysis

Each experiment was conducted three times, and the results are presented as the average ± standard error of the mean (S.E.M.). Data analysis was carried out using SPSS software, version 20.0. To determine significant differences between the control and experimental groups, a one-way Analysis

of Variance (ANOVA) was performed. The Duncan test was employed for post-hoc comparisons, with statistical significance set at $p<0.05$.

3.0 RESULTS AND DISCUSSIONS

Table 1 presents the proximate composition carried out among the three samples of unripe *Carica papaya*. This brings into focus their suitability or otherwise as food additive. From the study carried out, the mean carbohydrate content values were significantly lowest in all three samples as compared to the control. This result is in agreement with previous study done by (Arinathan, 2003). Therefore they might be considered to reduce cholesterol level, blood sugar, stroke risk and heart attack. In many developing nations, malnutrition is often just as much a result of insufficient calorie intake as it is of inadequate protein consumption (Defoliart, 1992). The mean protein value was significantly higher in steamed unripe *Carica papaya* as compared to both the unpeeled and peeled samples. Hence, the steamed unripe *Carica papaya* which has a higher protein content incorporated into the diet were it is expected to build skeletal muscles and other tissues. The fat content was significantly lower in unpeeled *Carica papaya* as compared to both the peeled and steamed respectively. Hence, the unpeeled maybe incorporated into the diet and expected to reduce the body fat content and help control several cardiovascular disorder such as atherosclerosis, hypertension and myocardial infection.

Table 1 Composition of Various Sample Feed Blends.

PARAMETER	**CONTROL**	**UNPEELED SUNDRIED**	**PEELED SUNDRED**	**STEAMED**
CARBOHYDRATE	65.70	21.20±0.92	23.77±0.65	20.15±0.27
DRY MATTER	83.01	1.91±0.04	24.12±7.85	25.25±5.35
PROTEIN	1.62	1.91±0.04	1.72±0.03	2.19±0.02
FATS	0.11	0.99±0.03	0.49±0.02	1.03±0.03
FIBRE	18.01	11.77±0.03	10.77±0.04	12.61±0.02
MOISTURE	18.01	7.61±0.85	6.48±0.61	8.15±0.19
ASH	9.54	7.51±0.02	6.75±0.02	8.53±0.03

RESULTS ARE EXPRESSED AS MEAN ± SEM

Means within the same roll carrying different letters are significantly different ($p<o.05$)

Also, the fibre content were not significantly different among the three groups observed. Hence, a diet rich in fibre may also help reduce the risk of obesity, heart disease and diabetes. Among the three different groups observed, the mean values of the moisture content was significantly higher in the steamed sample as compared to the unpeeled and peeled samples of matured unripe carica papaya. These values align closely with those reported by Puwastien *et al.* (2000). Where steamed unripe carica papaya was reported to be significantly higher compared to other samples. Hence, the steamed maybe easily susceptible to microbial attack and The ash content of a sample is a reflection of the amount of minerals contained in the samples (Mba, 1980). This was significantly higher in the steamed and lower in the peeled Hence, the steamed contains higher mineral content as compared to unpeeled and peeled matured unripe carica papaya.

Table 2 Effects of the consumption of unripe *carica papaya* on body weight

PARAMETER	CONTROL	UNPEELED	PEELED	STEAMED

Weight before feeding(g)	86.90±3.22[a]	62.30-2.50[c]	62.30±2.50[c]	76.30±2.80[c]
Weight after feeding(g)	136.81±11.30[a]	87.40±5 20[c]	95.39±3.95[b]	96.42±3.80[b]

RESULTS ARE EXPRESSED AS MEAN ±SEM

Means within the same roll carrying different letters are significantly different ($p<0.05$)
The data in Table 2 reveals that weight gain was significantly higher in both the steamed and peeled samples, whereas the unpeeled samples showed a notable decrease in weight gain compared to the control group. As a result, the peeled and steamed sundried samples could be seen as more palatable and may be added to the diet to increase calorie intake and enhance nutrient levels in the body.

Table 3: Effects of the Consumption of Unripe Carica Papaya on Blood Profile and Oxidative Stress.

PARAMETER	CONTROL	UNPEELED	PEELED	STEAMED
PCV	6.00±0.02[b]	4.00±0.03[a]	3.00±0.01[d]	5.00±0.02[c]
MDA	14.07±0.07[a]	11.30±0.12[b]	7.30+0.03[c]	7.02±0.05[c]
BILIRUBIN	0.39±0.02[a]	0.26±0.05[b]	0.27±0.05[b]	0.21±0.05[c]
ALBUMIN	0.44±0.12[a]	0.35±0.19[b]	0.21+0.16[c]	0.30±0.14[d]
TOTALPROTEIN	5.75±0.03[b]	5.96±0.02[a]	5.87±0.01[c]	5.81±0.03[c]

RESULTS ARE EXPRESSED AS MEAN ±SEM
Means within the same roll carrying different letters are significantly different ($p<0.05$)
Table 3 presents the impact of unripe Carica papaya on blood parameters and oxidative stress. The malondialdehyde (MDA) levels in the control group were higher than those in the other groups. Elevated MDA levels are linked to increased lipid peroxidation, which can lead to tissue damage and a failure of antioxidant defenses against excessive free radicals. The observed decrease in MDA levels in the study suggests that the diet's components may help reduce the formation of free radicals compared to the control.

Packed cell volume (PCV), or hematocrit, is commonly used to assess anemia, often alongside hemoglobin testing or as part of a complete blood count (CBC). This test can diagnose or monitor various conditions affecting the body's functioning. In this study, the PCV of albino rats fed different diets of unripe Carica papaya showed significant differences ($p<0.05$) compared to the control group, indicating that these feeds are unlikely to adversely affect blood chemistry or induce anemia in humans. Albumin, which comprises about 55-60% of total plasma protein, is a crucial protein in the body (Grant *et al*., 2007). The study found a significant decrease in albumin concentration in the rats fed different diets ($p>0.05$) compared to the control, supporting findings from Maye (1981).

The total protein test evaluates the concentrations of albumin and globulin in the body. Increased levels of total protein may be a sign of inflammation or infections, such as viral hepatitis B or C, or could indicate bone marrow disorders like multiple myeloma or Waldenström's macroglobulinemia. In this study, the total protein concentration in peeled and steamed feeds given to albino rats decreased significantly ($p>0.05$) compared to the control, possibly due to protein malabsorption in the animals' gastrointestinal tracts. Previous research has indicated that total protein levels can drop due to malnutrition, malabsorption, and liver diseases, while they can increase in chronic infections, liver dysfunction, dehydration, and hemolysis (Maye, 1981).

Bilirubin is a yellow pigment formed as a result of the breakdown of aged red blood cells. In the liver, it is secreted into the bile ducts and stored in the gallbladder. Bilirubin bound to sugar is referred to as conjugated bilirubin, while the unbound form is called unconjugated bilirubin. Elevated serum bilirubin levels may indicate conditions such as hemolysis, cirrhosis, gallstones, cancer of the gallbladder or pancreas, or drug toxicity. The bilirubin concentration in the feeds provided to albino rats decreased significantly ($p<0.05$) compared to the control, suggesting no signs of hepatotoxicity.

Table 4 outlines the effects of unripe Carica papaya on enzymes and nitrogenous compounds. The kidneys play vital roles in the body and are multi-functional organs within the urinary system. Due to their essential functions and the toxins they process, the kidneys are susceptible to various issues

Table 4 Effects of the Consumption of Unripe Carica Papaya on Some Enzymes and Nitrogenous Compounds in Rats.

PARAMETER	CONTROL	UNPEELED	PEELED	STEAMED
Alanine Transaminase(ALT)	0.05±0.02 [a]	0.04±0.01 [d]	0.02±0.03 [c]	0.03±0.02 [b]
Aspartate Aminotransferase(AST)	0.27+0.04 [b]	0.05±0.02 [a]	0.01±0.06 [c]	0.04±0.02 [b]
Gamma-glutamyltransferase(GGT)	0.27±0.04 [b]	0.18±0.06 [a]	0.25±0.05 [b]	0.12±0.23 [c]
CREATININE	19.13±0.03 [a]	8.35±0.01 [b]	6.55±0.02 [c]	4.02±0.04 [d]
UREA	4.09±0.24 [a]	3.27±0.32 [b]	2.14±0.40 [c]	2.15±0.38 [c]

RESULTS ARE EXPRESSED AS MEAN ± SEM
Values within the same row that have different letters are significantly different from each other.

The serum creatinine test assesses whether creatinine levels are rising in the blood. Results indicated that the creatinine concentration in albino rats fed different diets of unripe Carica papaya showed a significant reduction ($p>0.05$) in comparison to the control group. This finding aligns with Oduola *et al*. (2007), who also reported no evidence of renal toxicity in Wistar rats given aqueous extracts of unripe Carica papaya.

Elevated GGT levels may indicate liver diseases such as hepatitis, congestive heart failure, diabetes, or pancreatitis. The gamma-glutamyl transferase (GGT) test measures the enzyme's concentration in the blood, where GGT serves as a transport molecule. The study showed a significant decrease in GGT activity ($p>0.05$) in albino rats fed various diets compared to the control, suggesting that these feeds could help alleviate conditions like congestive heart failure, diabetes, or pancreatitis when included in the diet.

The aspartate transaminase (AST) test quantifies the enzyme levels in the blood. Elevated AST levels may result from liver damage due to conditions like hepatitis or cirrhosis, heart failure, kidney damage, mononucleosis, or the effects of certain medications. The study found that AST activity in rats fed unpeeled and steamed feeds was lower compared to the control group, corroborating Omotade *et al*. (2014), who reported no signs of liver parenchyma disease in Wistar rats fed unripe Carica papaya.

Similarly, alanine aminotransferase (ALT) activity in albino rats on different diets significantly decreased ($p>0.05$) compared to the control group. This is consistent with findings by Omotade *et al*. (2014), who also noted no signs of liver parenchyma disease in Wistar rats given mature unripe Carica papaya.

An increase in serum urea levels typically indicates renal toxicity. In this study, the urea concentration in albino rats fed various diets significantly decreased ($p>0.05$) compared to the control, suggesting no signs of renal toxicity. This finding aligns with the research by Josiah *et al*. (2010).

CONCLUSION

From the study done, the peeled and steamed samples of matured unripe *Carica papaya* have ability to improve hepatic and renal functions if incorporated into the diet. Also, steamed samples of matured *Carica papaya* have ability to reduce oxidative stress.

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