

1 2 IVER, RENAL, AND ANTI-OXIDANT FUNCTIONAL 3 BIOMARKERS CAN IMPROVE IN DOSE-DEPENDENT 4 ADMINISTRATION OF FRESH COCONUT OIL 5

6 Abstract:

7 Overtime, Oxidative stress has been implicated in the progression of diabetes mellitus
8 (DM) and its related disorders. To this point, several studies posit that antioxidant
9 constituents of virgin coconut oil among others might have a helpful effect in ameliorating
10 the disease. In this study, the impact(s) of ingestion of fresh coconut oil (FCO) on the liver,
11 kidney, and anti-oxidant biomarkers was investigated in alloxan-induced diabetic Sprague
12 Dawley. Ninety-eight (98) albino rats (100 - 150g) were randomly divided into two (2) units
13 of forty-nine (49) rats each; with each unit subdivided into seven (7) groups of seven (7)
14 animals each. At induction of diabetes mellitus (DM) in subgroups 2, 3, 4, 5, 6, 7 of unit 1
15 and B, C, D, E, F and G of Unit 2, rats in the 1 and A subgroups were left untouched to serve
16 as control. Whereas unit 1 (treated for 2 weeks), subgroups 2-7 respectively received nothing
17 (after DM confirmation), nothing (after DM confirmation), 7.5mg/kg of FCO, 10mg/kg of
18 FCO, 7.5mg/kg of FCO plus Vitamin E, 10mg/kg of FCO plus Vitamin E, and only Vitamin
19 E; Unit 2 animals (treated for 4 weeks) were given untreated (after confirming diabetes),
20 7.5mg/kg of FCO, 10mg/kg of FCO, 7.5mg/kg of FCO + Vitamin E, 10mg/kg of FCO and
21 Vitamin E, and Vitamin E respectively for B-G subgroups. Following administration of test
22 substance, serum samples were then collected from animals for biochemical analysis of liver
23 enzymes, renal biomarkers and antioxidants enzymes. One way analysis of variance
24 (ANOVA) proved that liver enzymes were significantly ($p < 0.05$) reduced, while antioxidant
25 enzymes (SOD and CAT) were significantly increased ($p < 0.05$), the electrolytes levels,
26 renal biomarkers (urea and creatinine) were insignificant. Also, changes recorded after four
27 weeks followed the same pattern, showing that dietary factor-Vitamin E, modulates the effect
28 of FCO. From this result, it is implied that FCO significantly improved metabolic parameters
29 especially with significant reduction in oxidative stress in Type 1 diabetes mellitus
30

31 **Keywords:** Anti-oxidant, Biomarkers, Diabetes, renal, hepatic
32

33 INTRODUCTION

34 Even though there has been little or no scientific information on the mechanism of
35 actions of some natural products and plants extracts¹, most have however been shown to pose
36 anti-diabetic tendencies. Coconut oil for instance, has been renowned throughout history for
37 its medicinal and nutritional value. In recent years, various experiments have been conducted

Comment [A1]: This should be liver not iver

Comment [A2]: I think this topic should be modified to either liver, kidney and anti-oxidant or hepatic, renal and anti-oxidant... I think the second is better

Comment [A3]: Ameliorating diseases not ameliorating the disease

Comment [A4]: I think this line should be rephrased to 'the effect of per oral administration of fresh coconut oil..

Comment [A5]: Sprague Dawley rats

Comment [A6]: Use 'Liver marker enzymes' instead

Comment [A7]: What is the basics for this comparism which group did you compare to which be specific please

Comment [A8]: What pattern did it follow can you be specific

Comment [A9]: Do add a reference

to show its biological effect(s). It has been shown to limit the activities of microbes and virus², enhance thyroid function and weight loss³, diminish the low density lipoprotein (LDL) concentration, plus increase plasma and tissue levels of high density lipoprotein (HDL) – cholesterol^{4&5}.

Comment [A10]: Add a reference

The health promotional abilities and possible mechanisms of action of this oil has been shown by various researchers⁶. A group of researchers suggested that it reduces oxidative stress by boosting the antioxidant defence system, scavenging free radicals and reducing lipid peroxidation; Another independent study suggested that the oxidative stress linked with diabetes mellitus can be possibly reduced by the administration of fresh coconut oil, and thus improve metabolic activities in the disease⁶. Iranloye *et al.*, (2013) reported that virgin coconut oil (VCO) causes a hypoglycaemic action by enhancing insulin secretion. They also showed the oxidative stress ameliorating effect of this oil on induced in type I (alloxan-induced) diabetic male rats^{6&7}.

Comment [A11]: You need at least a paragraph or half to talk about diabetes. This introduction is so filled with fresh coconut oil and virgin coconut oil. Make out space and talk about diabetes and the aspect of diabetes that has to do with oxidative stress

These proven abilities of the oil in promoting some of the health conditions could be due to its phytochemical constituents like polyphenols and vitamin E, which can boost the antioxidant defence structure⁵ and also, its medium chain fatty acids and unsaponifiable constituents. In recent times, great attention is being drawn to fresh coconut oil (FCO) as it is believed to be more beneficial than copra oil due to its method of extraction that makes it retain more of its natural active components⁶. The extraction of FCO from the fresh endosperm of coconut is thought to be more beneficial than usually prepared copra oil because its mode of extraction retains more biologically active components such as alpha tocopherol (vitamin E) and polyphenols⁶. Thus, this study was necessitated to determine the effect(s) of fresh coconut oil on the live, kidney, and antioxidant metabolites in type I diabetes in Sprague Dawley Rats.

Comment [A12]: Check this word again I don't think is correct

Aim of Study

Study aimed at investigating the effect(s) of fresh coconut oil (FCO) on biomarkers of liver, kidney, and antioxidant function in type I diabetes in sprague dawley rats. Study was specifically geared towards:

Comment [A13]: Antioxidant biomarkers

- i. ascertaining the effect(s) of FCO on Antioxidant Enzymes (Superoxide dismutase, Catalase and Malonaldehyde)
- ii. Investigating the effect(s) of fresh Coconut oil on Lipid profile (Total Cholesterol, Triglyceride, HDL and LDL).
- iii. assessing the effect(s) of fresh Coconut oil on liver enzymes (Alkaline Phosphatase, Alanine Aminotransferase, Aspartate Amino Transferase, Lactate Dehydrogenase, Gamma glutathione Transferase)

Methodology

Scope of Study

Study was best suited for rats as the invasive nature would be inappropriate in humans. It was limited to the effects of the ingestion of FCO on some metabolic functions specifically serum electrolyte levels, liver enzymes, Oxidative stress status - antioxidant enzymes and lipid profile, using Sprague Dawley Rats as experimental model

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Study Design

Ninety-eight (98) rats, weighing between 100 - 150g and bred in the Animal house of the Faculty of Basic Medical Sciences of Delta State University, Abraka were used for this study. Acclimatization was at the Animal house of the Department of Physiology of Delta State University, Abraka. Animals were then divided into two (2) units of 49 rats each. Each unit was further divided into Seven (7) groups, each containing seven animals ($n = 7$).

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UNIT 1

Group 1: Control (C): Normal rats fed with rat chow and drinking water.

Group 2: Diabetic rats untreated (DUT)

Group 3: Diabetic rats treated with 7.5mg/kg body weight of fresh coconut oil (DT_{7.5}) for two (2) weeks

94 Group 4: Diabetic rats treated with 10mg/kg body weight of fresh coconut oil
95 (DT₁₀) for two (2) weeks
96 Group 5: Diabetic rats treated with 7.5mg/kg body weight of fresh coconut oil (DT_{7.5}) +
97 Vitamin E for two (2) weeks
98 Group 6: Diabetic rats treated with 10mg/kg body weight of fresh coconut oil (DT_{7.5}) +
99 Vitamin E for two (2) weeks
100 Group 7: Diabetic rats treated with Vitamin E for two (2) weeks
101

102 UNIT 2

103 Group A: Control (C) Normal rats fed with rat chow and drinking water.
104 Group B: Diabetic rats untreated (DUT) for four (4) weeks
105 Group C: Diabetic rats treated with 7.5mg/kg body weight of fresh coconut oil (DT_{7.5}) for
106 four (4) weeks
107 Group D: Diabetic rats treated with 10mg/kg body weight of fresh coconut oil
108 (DT₁₀) for four (4) weeks
109 Group E: Diabetic rats treated with 7.5mg/kg body weight of fresh coconut oil (DT_{7.5}) +
110 Vitamin E for four (4) weeks
111 Group F: Diabetic rats treated with 10mg/kg body weight of fresh coconut oil (DT_{7.5}) +
112 Vitamin E for four (4) weeks
113 Group G: Diabetic treated with Vitamin E for four (4) weeks
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115 Materials

116 Used materials include; wire-guaze cages, normal rat Chow and clean water. A
117 well-ventilated animal house to allow for homeostatic conditions

118 Procedure

119 Ethical Clearance

120 Ethical clearance was obtained from the Research and Ethics Committee of the Faculty of
121 Basic Medical Sciences, College of Health Sciences, Delta State University, Abraka, Delta
122 State, with rules for handle of laboratory animals strictly adhered to.
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124 **Preparation of Fresh Coconut Oil (FCO)**

125 Matured coco-nuts were procured and its oil (FCO) was extracted using the wet
126 extraction method described by Nevin and Rajamohan (2006) and Dosumu *et al.*, (2010). The
127 solid endosperm was then crushed into thick slurry^{8&9}. About 500 millilitre (ml) of water was
128 added to the thick slurry obtained by squeezing through a fine filter to obtain the milk. The
129 resulting coconut milk was allowed to settle for about twenty four (24) hours, allowing for
130 sedimentation to take occur. This lead to separation of its emulsion (Demulsification),
131 producing different layers of an aqueous phase (water) at the bottom, an emulsion (cream)
132 formed the middle layer and oil on top of the emulsion. The oil on top was taken and heated
133 for about five (5) minutes to evaporate the moisture. Obtained coconut oil was filtered
134 thoroughly through a fine filter and stored at room temperature for use in the experiment.

135 **Sample Collection**

136 At the end of the 4 weeks period administering test substance, blood samples were
137 collected from the orbital sinus of all animals through ocular puncture, following which they
138 were sacrificed by cervical dislocation, with selected viscerals harvested for a separate study.
139 Serum was separated by centrifuging at 6000rpm for 15 mm. various biochemical analyses
140 were thereafter conducted on obtained blood samples.

Comment [A14]: 4 weeks of administering

141 **Induction of Diabetes Mellitus**

142 After two (2) weeks of acclimatization, Alloxan monohydrate was used to cause type
143 I diabetes in experimental animals. Intraperitoneal administration of 100 mg/kg body weight
144 of Alloxan monohydrate was administered once. A mild pressure was applied at the spot of
145 injection to enhance absorption. After 3 days of administration, fasting blood glucose level of

146 rats was measured. Rats with fasting blood glucose level above 200 mg/dl were considered
147 diabetic.

Comment [A15]: 200 mg/dl not 200mg/dl

148 Biochemical Assays

149 Determination of antioxidant enzymes and lipid peroxidation

150 At the end of the four (4) week period of experimentation, animals were euthanized
151 via cervical dislocation, with liver harvested, washed, crushed and homogenized in KCl
152 solution. The homogenate was diluted and centrifuged, while supernatant was decanted and
153 examined for various antioxidant enzymes as follows:

155 Superoxide Dismutase (SOD) Assay

156 Superoxide dismutase enzyme activity was determined according to the method of Soon and
157 Tan (2002)¹⁰. It was measured by its ability to inhibit auto-oxidation of epinephrine. The
158 assay was performed in 3.0ml of 50mM sodium bicarbonate buffer (in 2 different test tubes)
159 to which 0.02 ml of extract was added. 0.03 ml of epinephrine stock solution was then added
160 to the above before taking absorbance readings at 480nm for 3 – 5mins. A blank bereft of the
161 sample was used for circumstantial correction. Enzyme activities were expressed as SOD
162 units, where one unit of SOD is defined as the quantity of enzyme needed to inhibit fifty
163 percent (50%) epinephrine per minute, per milligram of protein at 25°C and pH 7.8.

164 atalase (CAT) Assay

Comment [A16]: Catalase not atalase

165 Activities of catalase enzyme was analysed according to the method of Soon and Tan
166 (2002) who measured the initial rate of H₂O₂ (50 mM) decomposition at 240 nm with the
167 results expressed in units/mg protein, where one unit is the amount of enzyme that hydrolyses
168 1 μmol of H₂O₂ per minute and per milligram of protein at 30°C and pH 8.0. To 0.3 ml (300
169 ul) of extract sample 1.8 of 30 mM H₂O₂ was added. Phosphate buffer was used as the blank
170 and their absorbance reading were taken at 240 nm at 60s intervals for 5mins.

Comment [A17]: What do you mean by per minute and per milligram please check your procedure again

Reduced Glutathione Assay

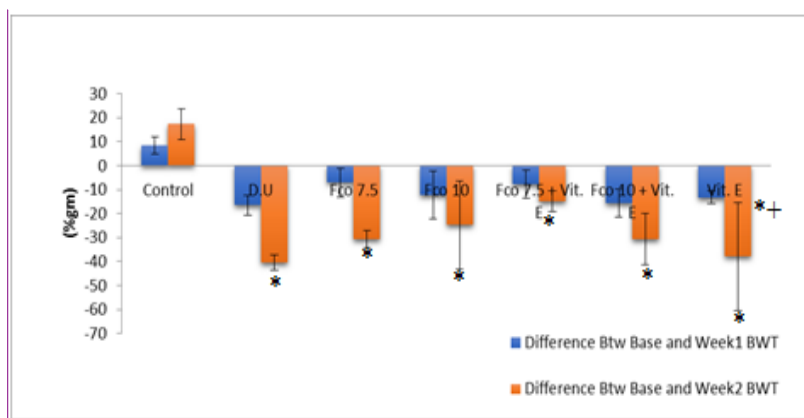
This was determined using 5, 5-dithio-bis-2-nitrobenzoic acid (DTNB) whose chemical formula is C and Tris-EDTA buffer with the absorbance being read at 412 nm (Soon and Tan, 2002). 100µl sample was added to 1ml of 0.2_M Tris-EDTA buffer, pH 8.2. 0.9_ml of 20_mM EDTA, pH 4.7 was added 20ul of 10mM DTNB was added and the sample was allowed to incubate at room temperature. The mixture was centrifuged and the absorbance of the supernatant was read against distilled water at 412 nm. Calculation was made using: $GSH = OD / X V/v$, where OD = absorbance; = extinction coefficient; V = total volume of reaction mixture; and v = volume of sample in reaction mixture.

Statistical Analysis

With data represented as mean standard deviation, Statistical analysis was done using One-Way Analysis of Variance (ANOVA). Statistics was carried out with SPSS 22 software. A p-level less than 0.05 was considered as statistically significant

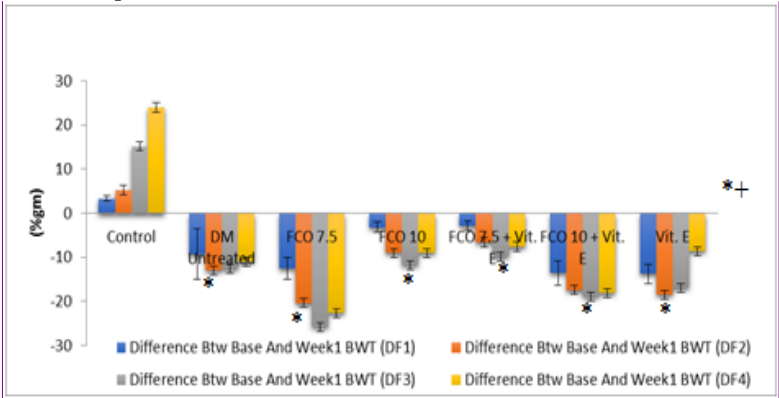
Results

CHART 1: Body weight changes after 2 weeks of treatment (Unit 1 Experiment)



Values are expressed as mean \pm S.E.M, n=5. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+)when compared with diabetic untreated.

192 | **FigureCHART 2:** Graphical representation of body weight changes after 4 weeks of
193 treatment (Unit 2 Experiment)

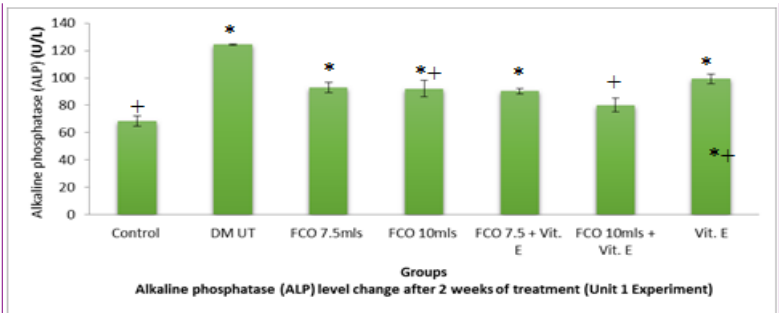


Comment [A20]: This result presentation is not well stated I can't see the figures to know the bases for the comparism

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Values are expressed as mean \pm S.E.M, n=5. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+)when compared with diabetic untreated.

CHART 3: Alkaline phosphatase (ALP) changes after 2 weeks of treatment (Units 1 and 2)

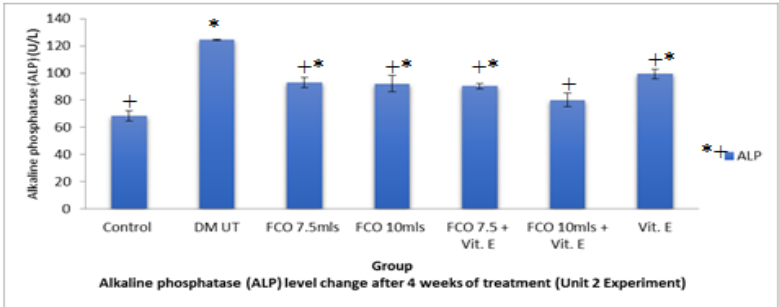


Comment [A21]: This is better

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Values are expressed as mean \pm S.E.M, n=5. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+)when compared with diabetic untreated.

CHART 4: Alkaline Phosphatase (ALP) changes after 4 weeks of treatment

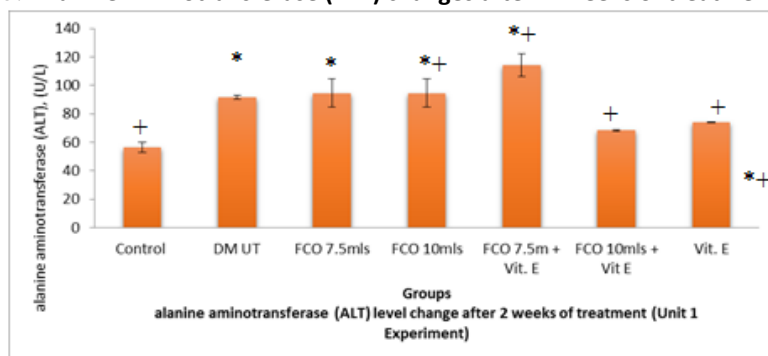


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Values are expressed as mean \pm S.E.M, n=5. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+)when compared with diabetic untreated.

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CHART 5: Alanine Aminotransferase (ALT) changes after 2 weeks of treatment

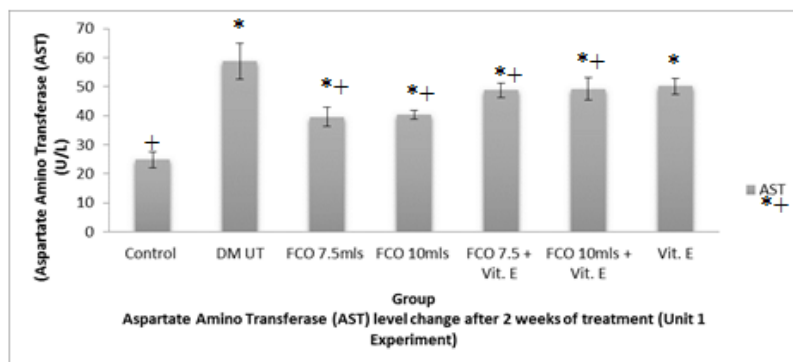


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Values are expressed as mean \pm S.E.M, $n=5$. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+) when compared with diabetic untreated.

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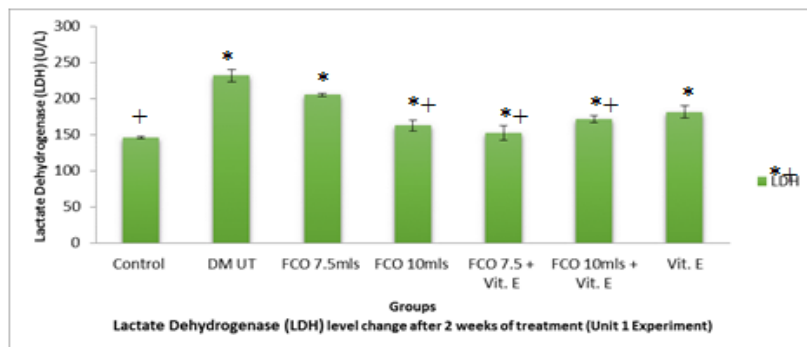
CHART 6: Aspartate Amino Transferase (AST) level changes of two weeks treatment in alloxan-induced diabetic rats



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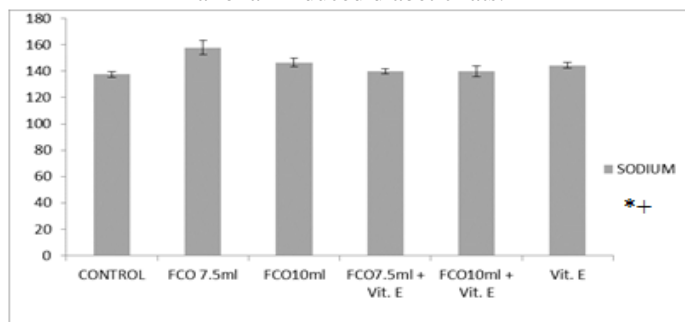
Values are expressed as mean \pm S.E.M, $n=5$. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+) when compared with diabetic untreated.

CHART 7: Effect of FCO extract on Lactate Dehydrogenase (LDH) level changes of four weeks treatment in alloxan-induced diabetic rats.



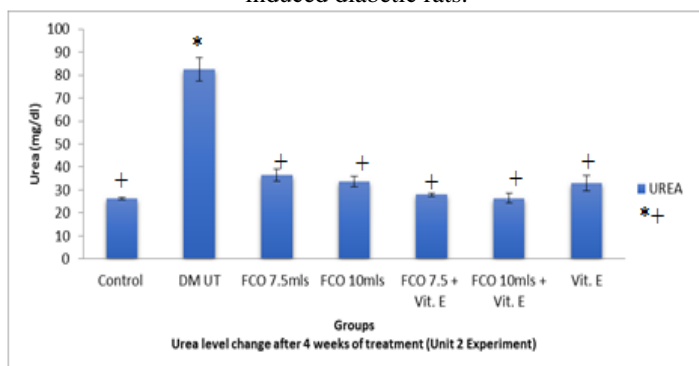
Values are expressed as mean \pm S.E.M, $n=5$. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+)when compared with diabetic untreated.

CHART 8: Effect of FCO extract on Sodium level changes of four weeks treatment in alloxan-induced diabetic rats.



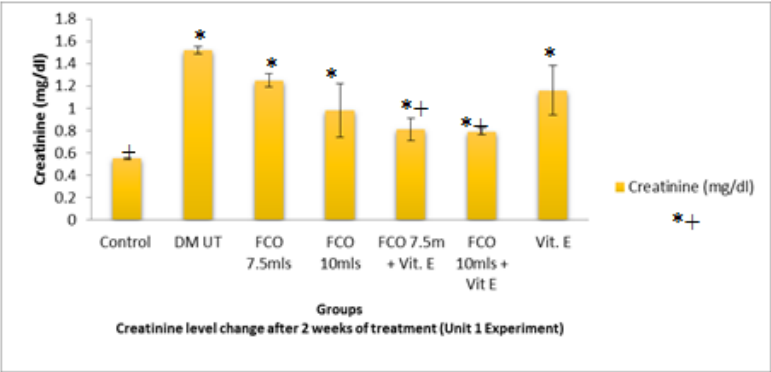
Values are expressed as mean \pm S.E.M, $n=5$. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+)when compared with diabetic untreated.

CHART 9: Effect of FCO extract on Urea level changes of four weeks treatment in alloxan-induced diabetic rats.



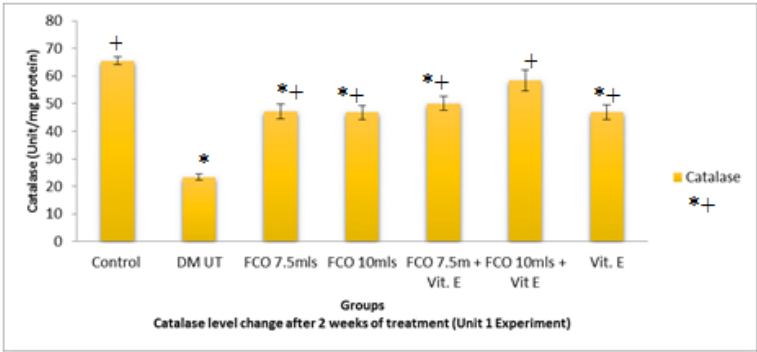
Values are expressed as mean \pm S.E.M, $n=5$. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+)when compared with diabetic untreated.

CHART 10: Effect of FCO extract on Creatinine level changes of two weeks treatment in alloxan-induced diabetic rats.



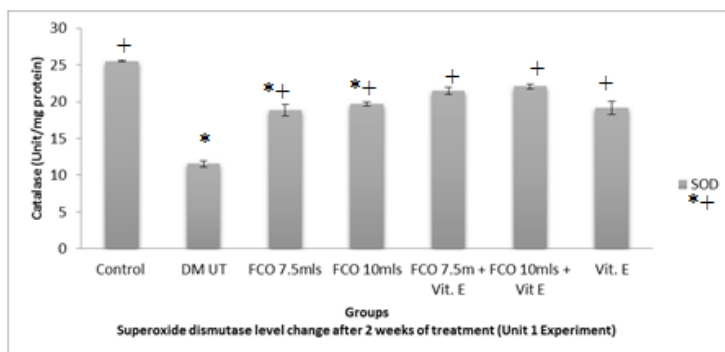
Values are expressed as mean \pm S.E.M, n=5. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P\leq 0.05$ level and designated as (*) when compared with control and (+)when compared with diabetic untreated.

CHART 11: Effect of FCO extract on Catalase level changes of two weeks treatment in alloxan-induced diabetic rats.



Values are expressed as mean \pm S.E.M, n=5. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P\leq 0.05$ level and designated as (*) when compared with control and (+)when compared with diabetic untreated.

CHART 12: Effect of FCO extract on Superoxide Dismutase (SOD) level changes of two weeks treatment in alloxan-induced diabetic rats.



Values are expressed as mean \pm S.E.M, $n=5$. Mean differences was compared using both one way analysis of Variance and Student-T test, and significant values were determined at $P \leq 0.05$ level and designated as (*) when compared with control and (+) when compared with diabetic untreated.

Discussion

Medicinal plants are commonly used by the inhabitants of developing countries as an alternative to orthodox therapy. In Africa alone, hundreds of plants are used traditionally for the management and/or control of diabetes mellitus. Regrettably, only a few of such African medicinal plants have received scientific examination and approval. Coconut has been listed by various authors as a potent medicinal nut.

The oil from this nut has been widely used throughout history for its medicinal value and has served man as important food for thousands of years^{11&12}. The proven abilities of coconut oil in promoting health could be due to phytochemical constituents like polyphenols and vitamin E which can boost the antioxidant defence structure⁵ and also, its medium chain fatty acids and unsaponifiable constituents. It contains a mixture of triglycerides consisting only of short and medium chain saturated fatty acids ninety-two percent (92%) and unsaturated fatty acids eight percent (8%) (Dayrit, 2003; Reynolds, 1982). Chemical analysis of Coconut water showed that it also contains L-arginine (5.85%), magnesium (0.42%), ascorbic acid (0.45%), potassium (7.71%), manganese (0.084%), calcium (1.32), total proteins (13.6%) etc. Among these, L-arginine noted to be the main bioactive component, which has been shown to have lots of beneficial antagonizing effects on diabetes¹³. The potential benefits of FCO in preventing or ameliorating different biological conditions due to its active polyphenol components has been demonstrated⁴. Below are is an analysis of the propableprobable explanations and theoretical structure of the findings from this study.

Chat 1(above) shows effect of FCO and Vitamin E on body weight of Wister rats after two weeks of treatment. Result shows significant loss in body weight obtained between first week and week 2, with a decrease in body weight. This decrease was significant when as

Comment [A22]: Used for what can you list the medicinal properties here

Comment [A23]: Food? Was the oil used for food or food supplement or what? I doubt if it was used as food

Comment [A24]: Is this your result? If not then move it to introduction and reference it

Comment [A25]: Significant at what p value

Comment [A26]: Significant at what p value

295 compared with control, implying that treatment with FCO and Vitamin E at all doses causes
296 significant decrease in body weight within two weeks of treatment in alloxan-induced
297 diabetes.

Comment [A27]: Significant at what p value

298 Chat 2(above) shows effect of FCO and Vitamin E on body weight (g) of Wister rats
299 after four weeks of treatment. Compared with control, result shows significant loss in body
300 weight (g) of all experimental groups. This implies that treatment with FCO at all doses with
301 Vit. E and separately does not improve body weight (g) in alloxan induced diabetes.

Comment [A28]: What is the biochemical implication of the decrease in the weight loss and how can you relate with the works of other researchers

302 Chats 3 and 4 show effect of FCO and Vit. E on the liver's Alkaline Phosphatase
303 (ALP) level after two weeks of treatment. Result shows a significantly elevated ALP level in
304 all experimental groups except FCO High dose combined with Vit.E (FCO 10mls +Vit.E)
305 group. Furthermore, when experimental groups were compared with diabetes untreated, there
306 was significantly decrease in ALP level in FCO separate and combined (FCO +Vit. E) high
307 dose groups, while others showed insignificant effect. This implies that treatment with FCO
308 at High dose separately and combined with Vit. E significantly improved ALP level while
309 FCO low dose and Vit. E separately does not in diabetes.

Comment [A29]: How can you relate this to the works of other researchers

310 Chat 5 shows effect of FCO and Vit. E on ALT level. Result shows significantly
311 elevated ALT level in all experimental groups except Vit. E separate and FCO High dose
312 combined with Vit.E (FCO 10mls +Vit.E). Moreover, when experimental groups were
313 compared with diabetes untreated there was significantly decreased ALT level in all
314 experimental groups. This implies that treatment with FCO at all doses and combined with
315 Vit. E separately improves ALT level in diabetes.

Comment [A30]: At what p value

Comment [A31]: How can you relate ALP with diabetes and what other researchers have done.

316 Chat 6 shows effect of FCO and Vit. E on AST level of Sprague Dawley Rats after
317 two weeks of treatment. Results show significantly difference in AST level in all
318 experimental groups when compared with control. However, when experimental groups were
319 compared with diabetes untreated there was significantly decreased AST level in all
320 experimental groups except in groups treated with Vit. E alone. This implies that treatment
321 with FCO at all doses and also when combined with Vit E. significantly improves AST level
322 in diabetes.

Comment [A32]: Relate your discussion with similar works by other researchers

Comment [A33]: At what p value

323 Chat 7 shows effect of FCO and Vit. E on Lactate Dehydrogenase (LDH) level.
324 Result shows significant difference in LDH levels for all experimental groups. In addition,
325 when experimental groups were compared with diabetes untreated, there was significantly
326 decrease in LDH level in all experimental groups except at Low dose FCO and Vit E alone.
327 This implies that treatment with FCO at High dose separately and in combination with Vit. E
328 at all doses significantly improves LDH level in alloxan induced diabetes.

Comment [A34]: You need to reference the works of other researchers while discussing your results

329 Chat 8 shows effect of FCO and Vit. E on Sodium level, of Sprague Dawley Rats
330 after four weeks of treatment. Results showed no significant change in Sodium level in all
331 experimental groups when compared with control. In addition there was no significant
332 change in Sodium level in all experimental groups when compared with diabetes untreated
333 group. This implies that treatment with FCO separately and combined with Vit. E do not
334 improve Sodium level in diabetes.

335 Chart 10 shows the effect of FCO and Vit. E on Urea level, of Sprague Dawley Rats
336 after four weeks of treatment. Results showed that Urea level is not significantly affected in
337 all experimental groups when compared with control. Moreover, when experimental groups
338 were compared with diabetes untreated, there was significantly decreased urea level in all
339 experimental groups. This implies that treatment with FCO at all doses and Vit. E separately
340 and combined significantly improves Urea level in diabetes.

341 Chart 11 shows effect of FCO on Catalase after two weeks of treatment. Result shows
342 significantly increased Catalase level in all treated groups except high dose FCO combined
343 with Vit. E when compared with control. Moreover, when experimental groups were
344 compared with diabetes untreated, there was significantly increased Catalase level in all
345 experimental groups. This implies that treatment with FCO at all doses and in combination
346 with Vit. E significantly improves Catalase level in diabetes. After weeks of treatment,
347 Catalase level was seen to have insignificantly been affected in all experimental groups
348 compared to control. Moreover, when experimental groups were compared with diabetes
349 untreated, there was significantly increased Catalase level in all experimental groups. This
350 implies that treatment with FCO at all doses and in combination with Vit. E significantly
351 improves Catalase level in diabetes.

352 Chart 12 shows effect of FCO and Vit. E on SOD level after two weeks of treatment.
353 Results show significantly decreased SOD level in FCO separate doses while combined FCO
354 and Vit. E experimental groups were not significantly affected as compared with control.
355 Moreover, when experimental groups were compared with diabetes untreated, there was
356 significantly elevated SOD level in all experimental groups. This implies that treatment with
357 FCO at all doses and Vit. E separately and combined significantly improves SOD level in
358 diabetes. For unit 2 animals, result shows significant effect on SOD level in all experimental
359 groups as compared with control. However, when experimental groups were compared with
360 diabetes untreated, there was significantly increased SOD level in all experimental groups.
361 This implies that treatment with FCO at all doses with Vit. E separately and combined,
362 significantly improves SOD level in diabetes.

Comment [A35]: You need to reference the works of other researchers while discussing your results.

Significance of Study

Study will play significant roles in the recent drive to investigate human metabolic functions with regard to diet and lifestyle, and thus provide general knowledge towards the dangers/benefits of natural products. The study will also establish mechanism on the ameliorative functions of fresh Coconut oil in the different parameters examined. Data generated from it will provide information that will aid proper delivery of health services by dieticians and other related practitioners.

Comment [A36]: This whole part should come after introduction not here

Conclusion

Treatment of diabetic rats with FCO significantly improved metabolic outcomes in diabetic Sprague Dawley Rats. In this study, FCO treatment was seen to rival the beneficial effects of vitamin E in almost all parameters measured, suggesting that FCO and Vitamin E treatment have similar anti-oxidant activities. More so, FCO treatments showed a dose-dependent effect on most parameters measured, with more significant outcomes in higher dose. These discoveries were orchestrated by a cascade of events within various mechanisms germane to physiological outcome

Recommendations

We recommend the frequent intake of FCO as it improve antioxidant enzyme activities, and causes a decrease in products of lipid peroxidation

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