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Effects of Aqueous Root Extract of *Treculia africana* on Glucose, Serum Enzymes and Body Weight of Normal Rabbits

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Abstract: The present study was undertaken to investigate the effect of aqueous root extract of *Treculia africana* on blood glucose levels, AST, ALT, and LDH activities, as well as body weight of normal rabbits. Oral administration of aqueous root extract of *Treculia africana* at a dose of 200 mg/kg body weight, for a period of 21 days, caused a significant ($p<0.05$) reduction in glucose concentration and AST activity, and a slight decrease in ALT activity. The treatment also showed no significant ($p>0.05$) effect on LDH activity and a slight increase in body weight of the test animals. These effects of the plant are a reflection of its hypoglycemic and hepatoprotective properties, as well as its relative safety and possible use for weight gain.

Key words: ALT, AST, hepatoprotective, hypoglycemic, LDH, *Treculia africana*, weight gain

INTRODUCTION

Since ancient time, phytotherapy has been used as folk medicine to treat various diseases. Medicinal plants are herbs which contain substances that can be used for therapeutic purposes, of which are precursors for the synthesis of drugs (Sofowora, 1984). A lot of research work has been carried out on some medicnal herbs and they have been found to have definite action on the nervous, circulatory, respiratory, digestive and urinary systems; as well as the sexual organs, the skin, vision, hearing and taste (Bailey and Day, 1989). *Treculia africana* belongs to the family Moraceae. It is an evergreen forest tree 10-30 (maximum 50m) in height and 3m in girth with a dense spreading crown and fluted trunk. Commonly called African breadfruit, it is a plant food native to Tropical West and parts of East Africa. The seeds extracted after macerating the fruit in water and then ground to a meal, known as breadfruit flour, which can be used to produce a variety of baked foods. Seeds can be dried, fried or roasted and eaten, and edible oil can be extracted from them. The grains have an excellent polyvalent dietetic value; the biologic value of its proteins exceeds even that of soybeans. The flour can be made into bread, pasta, table oil, margarine and baby food. The fruit-head pulp and bran which contain 9.4 and 5.7% protein respectively can be used in livestock feed. Analysis of the hexane extract of *Treculia* seeds indicate that it contains a stearine solid fat fraction, resembling that of palm-kernel oil, and an olein fraction with a composition similar to that of cottonseed oil. In Ghana, a root decoction is used as an anthelmintic and febrifuge. Ethnomedically, it is used as a verbrifuge, vermifuge, galactogogue and laxative (Ogbonnia *et al*., 2008). The caustic sap of male Africana breadfruit is applied on carious teeth; a bark decoction is used for cough and whooping cough, and ground bark with oil and other plant parts for swellings. It is also used in the treatment of leprosy and as a laxative. In West African, the seed meal is added to soap (Mbuya, 1994). The pods of Treculia africana have been evaluated for its nutritive properties by some workers for its flavonoids, phenolic and polysaccharide content (Akubor and Badifu, 2004; Chukwu *et al*., 1994). Considering the various uses of this plant, it was therefore necessary to investigate the effect of the plant on glucose and some serum enzymes, as well as its effect on body weight of normal rabbits, hence this study.

MATERIALS AND METHODS

Experimental animals: Ten adult rabbits of the New Zealand Strain, weighing between 1.6 to 1.9 kg, were obtained from the National Institute of Medical Research (NAIMR), Lagos State, Nigeria, and used for the study. They were housed in standard cages in a room in the animal house of the department of Biochemistry, University of Benin, with a 12 h light/dark cycle and 50-60% relative humidity, at a temperature of about 30ºC. The animals were allowed free access to feed (guinea

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Table 1: Effect of aqueous root extract of *Treculia africana* on plasma glucose concentration (mg/dl) of normal rabbits

	Day		
Group	0	8	21
Test	111.9±16.0*	92.6±10.3^{+*}	78.2±11.2$^{*,+,+*}$
Control	93.8±2.1	99.5±2.8	96.4±5.2^{+}

Values represent mean±SEM of glucose concentrations. n = 5, *p<0.05 (when the value at day 21 is compared to the baseline, i.e., day 0), $^{+}$p<0.05 (test compared to control at day 21), $^{+*}$p<0.05 (day 21 compared to day 8 of test)

Table 2: Effect of aqueous root extract of *Treculia africana* on AST activity (U/L) of normal rabbits

	Day		
Group	0	8	21
Test	39.2±11.1*	31.0±11.8$^{**,+*}$	23.8±2.6$^{*,+,+*}$
Control	41.8±10.7	37.8±6.8**,	39.4±5.6^{+}

Values represent mean±SEM of AST activity. n = 5, *p<0.05 (day 21 compared to baseline of test), $^{+}$p<0.05 (test compared to control at day 21), **p<0.05 (test compared to control at day 8), $^{+}$*p<0.05 (day 21 compared to day 8 of test)

Table 3: Effect of aqueous root extract of *Treculia africana* on ALT activity (U/L) of normal rabbits

	Day		
Group	0	8	21
Test	7.9±0.9	12.7±1.2**	18.3±1.6^{+}
Control	7.3±0.2	15.8±2.1**	20.5±1.6^{+}

Values represent means±SEM of ALT activity. n = 5; **: p<0.05 (test compared to control at day 8); $^{+}$: p>0.05 (test compared to control at day 21)

Table 4: Effect of aqueous root extract of *Treculia africana* on LDH activity (U/L) of normal rabbits

	Day		
Group	0	8	21
Test	166.7±5.9	162.8±2.5	165.1±7.5
Control	108.6±24.7	112.4±5.8	115.3±11.3

Values represent means±SEM of LDH activity, n = 5

grower's mash) and tap water, and were treated according to the International guidelines for the care and use of laboratory animals. They were allowed to acclimatize to the new environment for a period of two weeks, after which they were randomized into two groups (Test and Control) of five animals each and weighed.

Plant extract: *Treculia africana* roots were obtained from medicinal plant dealers at Oyingbo market in Lagos. Taxonomic identification of the plant was established in the Department of Pharmacognosy, University of Benin. The roots were washed, dried, chopped into bits, and pulverized. The powdered root was weighed and boiled in water for three days, using 10 mL of water per 1 g of the powder. It was boiled for 6 h the first day, 3 h the second day, and 2 h the third day. The mixture was then allowed to cool and subsequently filtered using sintered funnel. The extract (filtrate) was then concentrated using rotary evaporator and weighed.

Table 5: Effect of aqueous root extract of *Treculia africana* on body weight (kg) of normal rabbits

	Day		
Group	0	8	21
Test	1.71±0.06	1.91±0.05**	2.08±0.05*
Control	1.72±0.06	1.83±0.06**	1.88±0.06*

Values represent means±SEM of body weight (kg). n = 5, **: p<0.05 (test compared to control at day 8), *: p<0.05 (test compared to control at day 21).

Administration of extract: Prior to the administration of extract, the baseline plasma levels of ALT, AST, LDH and Glucose, and their body weight were determined. 200 mg/kg body weight of the extract was administered to the test animals, while the control animals received equivalent amount of water orally each day for a period of 21 days.

Sample collection and analysis: After treatment, blood samples were collected after fasting on days 8 and 21 for the determination of ALT, AST, LDH and Glucose, using the spectrophotometric methods. Also, their respective body weights were obtained.

Statistical analysis: Data are mean±SEM of five independent determinations. Statistical Analysis was by student t-test at p<0.05 using SPSS 17.0

RESULTS

This study carried out on aqueous root extract of *Treculia africana* showed its effects on Glucose, AST, ALT, LDH and body weight. Table 1 shows the effect of the extract on plasma glucose. Administration of *Treculia africana* root extract caused the levels of plasma glucose, in the test group, to decrease steadily during the treatment period. The value at day 21 was significantly (*p<0.05) lower than that at day 0 (baseline), and significantly ($^{+}$*p<0.05) lower than that at day 8. Also, at day 21, the plasma glucose concentration of the test group was shown to be significantly ($^{+}$p<0.05) lower than that of the control.

In Table 2, the serum AST (Aspartate aminotransferase) activity of the test group was shown to decrease steadily after administration of the plant extract. The decrease was significant (*p<0.05) at day 21, when compared to the baseline, and also significant ($^{+}$*p<0.05) when compared to the activity at day 8. Moreover, the AST activity of the test group was shown to be significantly ($^{+}$p<0.05) lower than that of the control, at day 21, and also at day 8 (**p<0.05).

Table 3 shows the effect of the extract on the ALT (Alanine aminotransferase) activity of the experimental animals. The ALT activity of the test group was shown to increase steadily all through the treatment period. This trend was also observed in the control group. However,

the ALT activity of the test group, at day 8 was shown to be significantly (**p<0.05) lower than that of the control. But at day 21, the decrease in ALT activity of the test group was not significant ($^{+}$p>0.05), when compared to the control.

In Table 4, the LDH (Lactate dehydrogenase) activity of the test group was shown to decrease slightly at day 8 and increased slightly at day 21, while that of the control group increased slightly and steadily. The various changes in LDH activity of both the test and control groups were however, not significant (p>0.05).

The body weight of the test group increased steadily after administration of extract, likewise that of the control (Table 5). However, the weight of the test group, at day 8, was shown to be significantly (**p<0.05) higher than that of the control. Also, at day 21, the weight of the test group was still significantly (*p<0.05) higher than that of the control.

DISCUSSION

Many indigenous medicinal plants have been reported by various authors to have hypoglycemic effects (Alman, 1979). Some of these hypoglycemic medicinal plants have been shown to significantly reduce blood glucose concentration in normal and diabetic animals. These plants, for example *Treculia africana*, tend to participate in the tight regulation of blood glucose levels as a part of metabolic homeostasis. Our result showed that administration of the aqueous root extract of *Treculia africana* at a dose of 200 mg/kg body weight for a period of 21 days to the test animals caused a steady decrease in their blood glucose level. The significant decrease in the blood glucose of the test animals as compared to the control is a reflection of the hypoglycemic effect of the plant. Apart from the glucose lowering effect of the plant extract, our findings also show its effects on the activity of some diagnostic enzymes.

Diagnostic enzymes are enzymes that are used in diagnosing or differentiating between certain or specific diseases (Omage *et al*., 2011). The two transaminases in use in diagnostic enzymology are aspartate aminotransferase (AST) and alanine aminotransferase (ALT). Transaminases are normally intracellular enzymes with the low levels found in the plasma representing the release of cellular content during normal cell turnover. The presence of elevated levels of aminotransferase indicate damage to cells rich in these enzymes e.g. physical trauma or a disease process which can cause cell lyses, resulting in release of intracellular enzymes into the blood (Champe *et al*., 2005). Thus, when enzymes are present in the blood, they are usually found in low concentrations, but when there is damage in an organ, the enzymes present in the organ (within the cells) leak out into the blood (Omage *et al*., 2011). Our result showed that the activity of AST of the test group decreased steadily and significantly. The decrease observed can be attributed to the effect of the plant extract, since the control did not show the same trend. AST concentration is lower in tissues that contain both transaminases except the liver where they exist in virtually equal amounts. It rises up to 100 times the upper limit of normal in several tissue injuries such as in acute hepatitis and liver necrosis. The rise may occur before any clinical signs or symptoms such as jaundice manifests. It is thus a sensitive index of acute damage of hepatic parenchyma cells. Being useful in detecting the onset of/early hepatitis or "latent" liver cell damage. The reduction in the activity of AST caused by the plant extract may portend its protective effect against the onset of injury to the hepatic parenchyma cells. Concomitant rise in the level of ALT occurs with AST rise but is usually a particular smaller rise than the AST rise. However, ALT could be higher than AST in hepatitis, but AST assay is the preferred one for liver function test where only one of the two can be measured. Besides AST is found in both the cytoplasm as well as the mitochondria, greater release of it suggests gross damage which has penetrated beyond the cytoplasm as occurs in severe and chronic damage. Our findings showed that despite the treatment with the plant extract, the test group still showed steady increase in the activity of ALT. This increase, which is within the normal range, was shown to be lower in all cases/throughout the treatment period as compared to the control. Thus, the control group also showed a steady increase in ALT activity. This however suggests that the slight increase observed in the test group may not be due to the effect of the plant, but rather by other factors which could be physiological or environmental. However, fluctuations of ALT levels are normal over the course of the day and persistent increase over a long period of time may indicate possible liver problem.

Lactate dehydrogenase (LDH) is an enzyme found in the cells of many tissues including the heart, liver, kidney, skeletal muscle, brain, red blood cells and lungs. It is responsible for converting lactic acid into pyruvic acid, an essential step in providing cellular energy (Mathew, 1995). LDH is present in almost all body tissues, so the LDH test is used to detect tissue alterations and as an aid in the diagnosis of heart attack, anemia, and liver disease (David, 1996). During the treatment period, the aqueous root extract of *Treculia africana* was shown to cause no definite effect on the LDH activity of the test animals. This indicates that the different organs or tissues where this enzyme is found (i.e. the liver, heart and muscles) were not affected. This study therefore shows that the aqueous root extract of *Treculia africana* is not toxic to this organs or tissues. It was also shown that the plant extract caused a slight but significant increase in the body weight of the test animals. Though the active principles of the plant extract are not known, but the increase in weight may be due to increase in appetite or effect of the plant on

the body fat metabolism. This however, remained to be rationalized.

CONCLUSION

It is interesting to know that the oral administration of aqueous root extract of *Treculia africana* for a period of 21 days caused a significant reduction in blood glucose level and AST activity of the test animals. It also caused a slight reduction in the activity of ALT and showed no significant effect on the activity of LDH, and caused a slight increase in their body weight. This portends the hypoglycemic and hepatoprotective effect of the plant, its relative safety and its possible use for weight increase.

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REFERENCES

Akubor, P.I. and G.O. Badifu, 2004. Chemical composition, functional properties and baking potential of African breadfruit kernel and wheat flour blends. Int. J. Food Sci. Technol., 39(2): 223-229.

Alman, R., 1979. Recent research in indigenous antidiabetic medicinal plants in overall assessment. Indian J. Physiol. Pharm., 14: 65-76.

Bailey, C.J. and C. Day, 1989. Traditional plants medicines as treatments for diabetes. Diabetes Care, 12(8): 552-556.

Champe, P.C., R.A. Harvey And D.A. Perrier, 2005. Removal of Nitrogen from Amino Acids. Lippincott Illustrated Biochemistry. 3rd Edn., Lippincott and Co. Philadelphia, pp: 248-257.

Chukwu, A., S.I. Ofoefule and K. Ugoeze, 1994. Studies on the pharmaceutical application of a polysaccharide derived from (*Treculia Africana)* fruit. Bull. Chim. Farmaceut., 136(8): 539-544.

David, J.S., 1996. Laboratory Test Handbook. 4th Edn., Lexi Comp. Inc., New York.

Mathew, C., 1995. Handbook of Diagnostic Tests. Springhouse Corporation, Springhouse, P.A.

Mbuya, L.P., 1994. Useful Trees and Shrubs for Tanzania: Identification, Propagation and Management for Agricultural and Pastural Communities. Regional Soil Conservation Unit (RSCU), Swedish International Development Authority (SIDA).

Ogbonnia, S.O., J.L. Odimegwu and V.N. Enwuru, 2008. Evaluation of hypoglycemic and hypolipidemic effects of aqueous ethanolic extract of (*Treculia Africana)* decne and bryophyllum pinnatum lam and their mixture on streptozotocin(STZ)-induced diabetic rats. Afr. J. Biotechnol., 7(15): 2535-2539.

Omage, K., O.G. Erifeta, J.S. Josiah, S.E. Uhunmwangho, C.S. Nwangwu, K.H. Njoya and A.A. Asuk, 2011. Effect of acalypha wilkesiana on activities of some liver function enzymes and body weight of normal rabbits. Pak. J. Nutri., 10(6): 552-554.

Sofowora, A., 1984. Medicinal Plants and Traditional Medicin in Africa Johnwiley, New York, pp: 256-257.