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Extracts of Moringa oleifera a sure bet for Hyperlipidemia management

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Abstract: *In recent decades, cardiovascular diseases have emerged as major cause of morbidity and mortality in many countries. Hyperlipidemia, a condition characterized by elevation of any or all lipid profile in the blood, notably dyslipidemia has been a growing concern. Its remedies are very expensive, associated with side effects and not readily accessible unlike herbal remedies. Moringa oleifera has become a popular herb in the community yet there is insufficient scientific evidence to explain the mechanism of action and validate its apparent uses and efficacy. The present study was carried out to compare the antilipidemic activity of methanolic leaf and stem -bark extracts of Moringa oleifera using diet induced hyperlipidemia model in Wistar albino rats. Rats were induced by feeding them with high fat diet (100g cholesterol, 50g cholic acid, 1L of coconut oil supplemented with egg) save control. 48 rats weighing between 180-200g were grouped into six (A-G). Group A received normal feed, B - high fat diet, C received high fat diet plus statin, D-E were fed with high fat diet mixed with 300mg/kg and 600mg/kg leaf extracts while G-F received high fat diet in 300mg/kg and 600mg/kg stem-bark extracts of moringa oleifera respectively. After treatment, the plasma total cholesterol (TC), triglycerides (Tg), high density lipoprotein (HDL), low density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels were analyzed using standard method. The result showed significant reduction in TC, Tg, LDL and increase in HDL ($P<0.001$) in all when compared to negative control. These show a protective effect as any increase in blood level of TC, Tg and LDL predisposes hyperlipidemia a precursor of atherosclerosis and other lipid related ailments. The study proved that high concentration stem-bark extract of Moringa oleifera is highly antilipidemic than other test groups.*

Keywords: Moringa oleifera, hyperlipidemia, Cholesterol management and dyslipidemia.

I. Introduction

Despite their proven efficacy, allopathic medicines are more expensive and are also presumed to be associated with a lot of side effects and they are moreover not readily accessible to the majority of the people who need them. Example of such drug is statin [1, 2 and 3]. On the other hand, herbal remedies are seen as less expensive and less toxic [2]. The WHO recognizes herbal medicines as a valuable and readily available resource for Primary Health Care and she has endorsed their safe and effective use [4]. She however recommends that many herbal remedies still need to be studied scientifically while recognizing the experience obtained from their prolonged safe use over the years in the treatment of various conditions in both humans and animals, such as cardiovascular diseases (CVDs) like hyperlipidemia, diabetes mellitus, hypertension, obstetric conditions etc [4].

The use of medicinal plants in West Africa is probably as old as the duration of human settlement in the region [5, 6]. Among the medicinal plants that are commonly used in management of various conditions is Moringa oleifera. This herb has been reported in the management of cardiovascular disease such as hypertension and in inducing abortion by women in India and some African countries [7, 8].

Substances in Moringa oleifera which are similar to those derived from other herbs (for example glycosides) have become a basis for some of the commercial medications used today for the treatment of heart disease, high blood pressure, pain, obstetric and other medical problems such as diabetes [9], cancer and AIDS [10]. Traditionally women use herbal preparations for labour. Moringa oleifera has been reported to be used by women for contraception and as an abortifacient [7]. Moringa oleifera is reportedly used for treatment of painful uterus, inducing uterine contractions, management of retained placenta and post partum bleeding among other conditions and have thus been found useful in obstetric practice [11].

Moringa oleifera appears to have multi-system effects in the human body as shown by its numerous reported uses [12]. Despite their reported beneficial uses, Moringa oleifera has been reported to cause abortion in rats [7]. It has also been reported that compounds similar to those present in Moringa oleifera (cardiac glycosides) is toxic and can lead to death [13]. However, different parts of Moringa oleifera have been employed in treating so many diseases such as cancer, ulcer, diabetes asthma, hyperlipidemia to mention but a few. It has become a popular herb in the community yet there is insufficient scientific evidence to explain the

mechanism of action and validate its apparent uses and efficacy.

In recent decades, cardiovascular diseases have emerged as major causes of morbidity and mortality in many countries with hypertension being the commonest [1]. Hyperlipidemia is a medical condition characterized by an elevation of any or all lipid profile and/or lipoproteins in the blood. It is also called hypercholesterolemia/hyperlipoproteinemia [14]. Elevated low density lipoprotein cholesterol (LDL) is thought to be the best indicator of atherosclerosis risk, [14], dyslipidemia (abnormal amount of lipids in the blood) can also describe elevated total cholesterol (TC) or triglycerides (TG), or low levels of high density lipoprotein cholesterol (HDL). In this study, we employed the methanolic extracts of leaf and stem-bark of Moringa oleifera to evaluate its antilipidemic effect in comparison to routine drugs. We found that the stem-bark extract are more protective than the leaf extract and that its activity is concentration dependent.

II. Materials and methods

The present study was carried out to compare the antilipidemic activity of methanolic leaf and stem - bark extracts of moringa oleifera using diet induced hyperlipidemia model in wistar albino rats. Hyperlipidemia was induced by feeding all rats except control with high fat diet (100g cholesterol, 50g cholic acid, 1L of coconut oil supplemented with egg). 48 rats weighing between 180-200g were divided into six groups of six each. Group A positive control (normal feed), Group B negative control (high fat diet), Group C received high fat diet statin, Group D and E received high fat diet plus 300mg/kg and 600mg/kg leaf extracts while Group F and G received high fat diet in addition to 300mg/kg and 600mg/kg stembark extracts of Moringa oleifera respectively.

III. Results and discussion

Hyperlipidemic induced rats were treated with routine drug (statin) and extracts of Moringa oleifera to evaluate their antilipidemic properties. The lipid profiles tested were serum total cholesterol (TC), triglycerides (Tg), high density lipoprotein (HDL), low density lipoprotein(LDL) and very low density lipoprotein (VLDL). The results are detailed in various profile headings below.

Moringa oleifera reduces serum total cholesterol. After treatment, the result showed that stem-bark extract was highly protective as evidenced by significant fall in total cholesterol when compared to high fat diet (Negative control) ($P<0.001$) (Figure 1). We also found out that its protective effect was highly statistically significant in comparison that that of routine drug (Statin) ($P<0.001$).

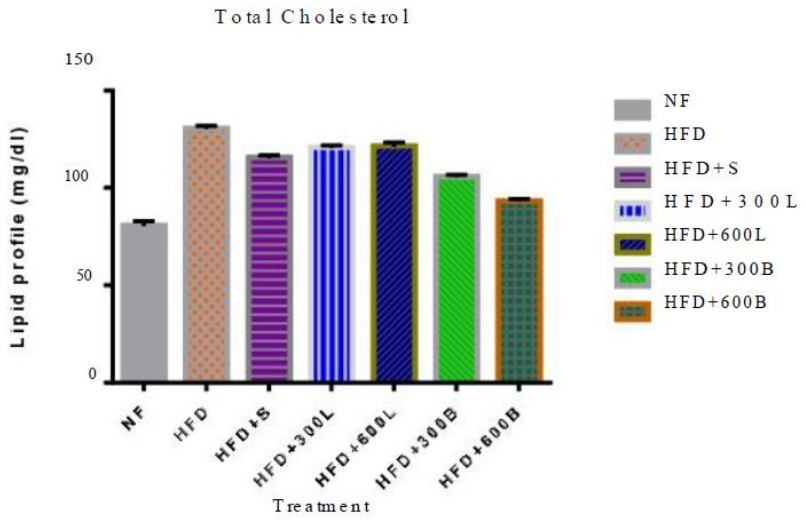

Figure 1 Bar chart showing variations of serum cholesterol as a result of hyperlipidemia (HFD) and its treatment with statin (HFD+S) and extracts (leaf and stem bark) of moringa oleifera at various concentrations compared with normal (NF). Stem-Bark (HFD+300B and 600B) extracts at 300mg/kg and 600mg/kg were more protective significantly ($P<0.001$) when compared to high fat diet cholesterol. Their efficacies were concentration dependent.

When compared with positive control (Normal fed rats), there were no difference. The stembark extract protective effect was concentration dependent as shown in figure 1. This evidenced that 600mg/kg application was more protective than 300mg/kg. Finally the leaf was leaf antilipidemic when compared with the stem-bark extract. The result also indicated that the protective effect of the leaf extract was no significantly different from

that of routine

Drug Moringa oleifera extracts affects serum triglycerides Similar result to that of total cholesterol were obtain when triglyceride were evaluated (Figure 2). The results showed that stem-bark extract was highly protective when compared among High fat diet (P<0.001), routine drug (P<0.001) and Leaf extracts (P<0.01). When compared with the result of the normal rat TG, stem-bark extract of Moringa oleifera application showed no significant difference. Even the 600mg/kg application resulted to significant lowering of Tg when compared to normal (positive control) (P<0.05).

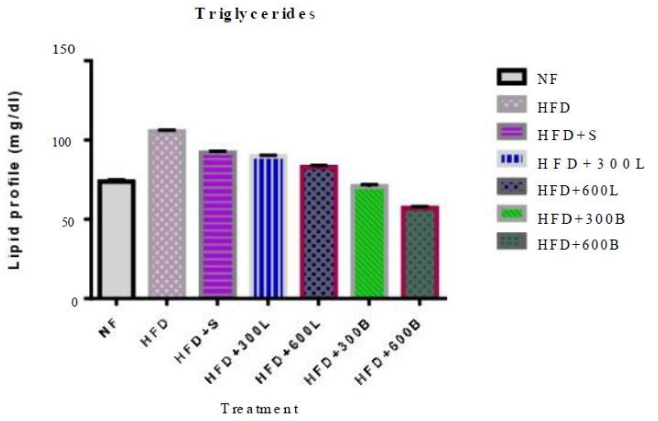

Figure 2 Bar chart showing variations of serum triglyceride as a result of hyperlipidemia (HFD) and its treatment with statin (HFD+S) and extracts (leaf and stem bark) of moringa oleifera at various concentrations compared with normal (NF). Stem-Bark (HFD+300B and 600B) extracts at 300mg/kg and 600mg/kg were more protective significantly (P<0.001) when compared to high fat diet and other test groups triglyceride. Their efficacies were concentration dependent.

The leaf extract of moringa oleifera application was not significantly different from that routine drug treatment. The protective effects were also concentration dependent in both leaf and stem-bark extracts.

Moringa oleifera extracts application reduces serum LDL Our result also showed that LDL concentration was drastically reduced on application extracts of Moringa oleifera (Figure 3).

In this case, application of leaf extract of Moringa oleifera was significantly lower than negative control (P<0.001) but higher than routine drug (Statin) (P<0.001). Thus the routine drug reduces serum LDL than leaf extracts of Moringa oleifera. However, the stem-bark extract of moringa oleifera significantly lowered LDL than all test groups (P<0.001). Although the 300mg/kg of stem-bark extract application was less protective when compared to normal (P<0.001) there was difference between 600mg/kg stem bark extract and normal rat LDL (Figure 3)

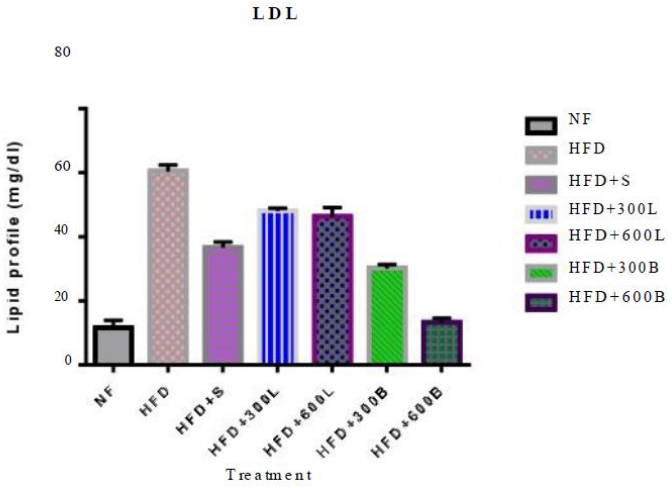

Figure 3Bar chart showing variations of serum LDL as a result of hyperlipidemia (HFD) and its treatment with statin (HFD+S) and extracts (leaf and stem bark) of moringa oleifera at various concentrations compared with normal (NF). Stem-Bark (HFD+300B and 600B) extracts at 300mg/kg and 600mg/kg were more protective significantly (P<0.001) when compared to high fat diet and other test groups LDL. Their efficacies were concentration

Dependent to the level that 600mg/kg stem-bark extract application lowered LDL to almost normal value (NF).

In all, the protective effects of stem-bark extracts of moringa oleifera application on hyperlipidemic induced rats were still concentration dependent.

Moringa oleifera application affects serum VLDL

When the serum very low density lipoprotein (VLDL) was evaluated, the result still evidenced the protective effect of the leaf and stem-bark extracts of Moringa oleifera (Figure 4). The stem-bark extract of moringa oleifera antilipidemic properties were prominent and concentration dependent. Its VLDL reduction was significant when compared among all test groups (P<0.001). The 600mg/kg stem-bark extract application effect on VLDL were similar to normal rat VLDL see figure 4 for details graphically.

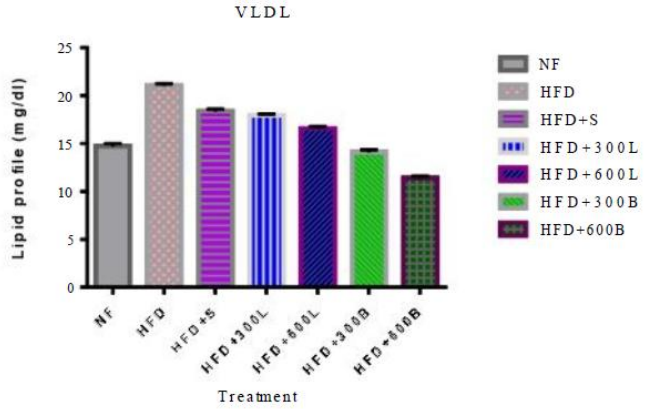

Figure 4 Bar chart showing variations of serum VLDL as a result of hyperlipidemia (HFD) and its treatment with statin (HFD+S) and extracts (leaf and stem bark) of moringa oleifera at various concentrations compared with normal (NF). Stem-Bark (HFD+300B and 600B) extracts at 300mg/kg and 600mg/kg were more protective significantly (P<0.001) when compared to high fat diet and other test groups VLDL. Their efficacies were concentration dependent in that the normal fed rats VLDL serum level were even higher than that of 600mg/kg stem-bark extract application

The leaf extracts of Moringa oleifera were also antilipidemic in nature but less than that of stem-bark application. In all, application of extracts of Moringa oleifera on hyperlipidemic induced rats showed a significant protective effect than routine drug.

Moringa oleifera application improves serum HDL

Increase in high density lipoprotein shows a positive effect, this was also evidenced in our study as application of both extracts of moringa oleifera on hyperlidemic induced rats showed a favorable rise in serum HDL concentration (Figure 5). The application of leaf extract were not different from the routine drug but both were significantly lower when compared to the stem-bark extract (P<0.001) especially the 600mg/kg extract.

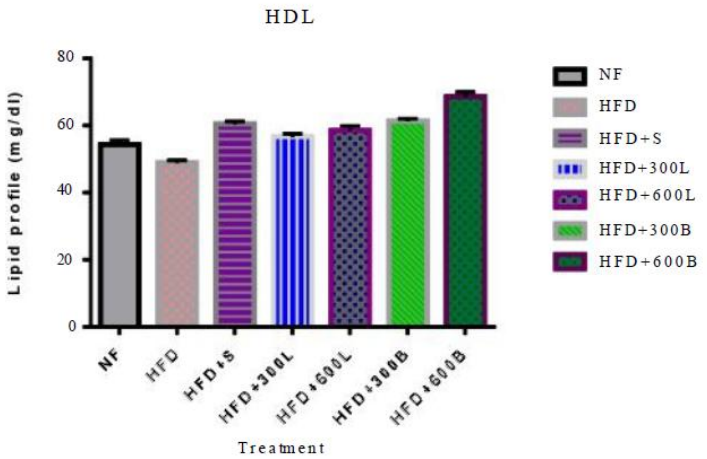

Figure 5 Bar chart showing variations of serum HDLas a result of hyperlipidemia (HFD) and its treatment with statin (HFD+S) and extracts (leaf and stem bark) of moringa oleifera at various concentrations compared with normal (NF). Stem-Bark (HFD+300B and 600B) extracts at 300mg/kg and 600mg/kg were more protective significantly ($P<0.001$) when compared to high fat diet and other test groups HDL conentrations. Their efficacies were concentration dependent.

The result, in all were concentration dependent, all test groups were significantly higher than even normal fed rat's HDL indicating that both routine drugs and extracts of Moringa oleifera has a protective effect - antilipidemic properties.

These show a protective effect as any increase in blood level TC and TG predisposes hyperlipidemia a precursor to atherosclerosis and other lipid related ailment. Our report was in agreement with their earlier studies that increase in LDL, Cholesterol and decrease in HDL predisposes to atherosclerosis [14, 15, 16, 17 and 18]. This study proved that high concentration stembark extract of Moringa oleifera is highly antilipidemic than other test groups.

IV. Conclusion

Herbal remedies have been on the increase especially due to side effects of allopathic drugs. The extracts of moringa oleifera despite its many useful benefits in treatment of various ailments also showed a convincing antilipidemic effect. The leaf and stem-bark extract of moringa oleifera application on a hyperlidemic rat reduced the serum cholesterol, triglyceride, LDL, VLDL and increased HDL. Thus there are protective especially the stem-bark extract. The latter were more beneficial than even the routine drug. Hence a promising herbal remedy for the control and management of lipid related diseases such as the atherosclerosis

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