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Effects of methanolic extracts of *Balanites Aegyptiaca, Cassytha Filiformis* and *Boswellia Dalzielii* on lipid profile in male wistar rats

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Abstract
The effect of methanolic extracts of Balanite aegyptiaca, Cassytha filiformis and Boswellia dalzielii on lipid profile parameters in male wistar rats were evaluated. The sub chronic effect of the methanolic extracts was investigated after daily oral administration for 21 days at different dose levels (50, 100, and 200 mg/kg BW) in male wistar rats. The effects on lipid profile [total cholesterol (TC), total triglyceride (TG) and high density lipoprotein (HDL)] were measured as indices of toxicity. Results showed that methanolic extracts of Balanite aegyptiaca, Cassytha filiformis and Boswellia dalzielii generally had significant($p<0.05$) hypolipidemic effect on lipid profile when compared with the control, which had cholesterol, triglyceride and high density lipoprotein values 1.78, 1.25, 1.76mmol/L respectively. The result demonstrated that concentration of total cholesterol in the animals administered with Cassytha filiformis extract at doses 50, 100 and 200mg/kg body weight were 1.25, 1.31, 1.35mmol/L respectively, total triglyceride concentrations at doses 50, 100 and 200mg/kg were 0.77, 0.49 and 0.76mmol/L respectively and HDL values at doses 50, 100 and 200mg/kg respectively were 0.76, 0.76 and 0.87mmol/L respectively. These values showed decrease in the level of lipid profile parameters when compared with the normal control results. From this study it can be concluded that methanolic extracts of Cassytha filiformis administered at all the doses had the highest hypo- lipidemic effect at 50mg/kg.

Keywords: Tryglycerides, HDL, lipoprotein, methanolic extracts, lipid profile

Introduction

The liver is an essential organ crucial for metabolism, detoxification, and maintaining homeostasis. It plays a pivotal role in regulating macronutrient metabolism, supporting the immune system, managing lipid and cholesterol balance, and detoxifying xenobiotic substances (Toxicology Reports, 2025) [17]. Globally, liver diseases are emerging as a significant health concern, causing around 2 million deaths per year. One million deaths are attributed to complications of cirrhosis, with an additional half a million resulting from liver cancer and viral hepatitis. Cirrhosis ranks 11th and liver cancer 16th in terms of mortality, collectively accounting for about 3.5% of total global deaths (Toxicology Reports, 2025) [17].

In Nigeria, a rich tradition of herbal medicine exists. Plants such as *Balanites aegyptiaca*, *Cassytha filiformis*, and *Boswellia dalzielii* are frequently cited by traditional healers in Northern Nigeria for their purported efficacy in treating liver disorders.

Balanites aegyptiaca (L.) Delile, commonly known as the desert date, is a medicinal tree widely recognized in traditional medicine for its antidiabetic and liver-enhancing properties (Abdelsalam, *et al*. 2025) [1]. *Cassytha filiformis* is a medicinal plant known for its parasitic nature, attaching itself to host plants to obtain nutrients, and offers a wide range of therapeutic applications. It has been employed in European, Siddha, Ayurvedic, and Chinese traditional medicine (Bachheti, *et al*. 2025) [6].

Toxicity studies which is the study of the symptoms, mechanisms, treatment and detection of poisoning, especially the poisoning of people, is done usually by the assessment of the level of damage done to the liver and the kidneys which are the chief organs responsible for the metabolism of xenobiotics in the body (Goje *et al*., 2013) [10].

Among the promising traditional medicinal plants, three medicinal plants: *Balanites aegyptiaca*, *Cassytha* filiformis *and Boswellia denzielii* were the major focus of this study. Stem bark extracts of these plants were administered to male wistar albino rats and their lipid profile parameters were analysed.

Medicinal plants are various plants thought by some to have medicinal properties, but few plants or their phytochemical constituents have been proven and approved by some regulatory agencies such as National Agency for Food and Drug Administration and Control (NAFDAC) in Nigeria, United State Food and Drug Administration and the European Food Safety Authority to have medicinal effects. For centuries, medicinal plants have been the most important source of life saving drugs for the majority of the world's population.

Plants have been an important source of medicine for thousands of years that even currently; the World Health Organization (WHO) estimated that up to 80% of people over the world still rely on traditional remedies such as herbs for their medicines. Medicinal plants have one or more parts with medicinal properties, and of the pharmacologically active principles found in plant kingdom, higher plants are arguably the most important group. They also cover the wide range of pharmacological effects which remain poorly understood. Out of the estimated 800,000 plant species on earth, about a quarter have been categorized and only a small fraction of these have been examined for pharmalogical efficacy.

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Balanites aegyptiaca

Balanites aegyptiaca is a perennial tropical plant that belongs to the family *Balanitecea.* They may be grown for both its fibre and oil. In Africa and some developing countries, it is used for food preparations and herbal medicine. Extracts from several parts of this tree have been intensively used in Africa and India for various ethno botanical purposes. It is called desert date (English), Adowa (Yoruba, Nigeria), adua or Aduwa (Hausa, Nigeria), tanni (Fulfulde, Nigeria), cungo (Kanuri, Nigeria) and heglig (Arabic). The plant attains a height of more than 6m. It has a multiplicity of uses and almost every part of the plant is useful including, leaves, thorns, back of root and fruit. *Balanites aegyptiaca* has been used over thousands of years. The seed oil of *Balanites aegyptiaca* has been used in Nigeria as ingredient and substitute to groundnut oil as food supplement and also in traditional medicine. The fleshy pulp of the fruit is eaten fresh or dried. It contains 64 – 72 % carbohydrates, plus crude protein, steroidal saponins, vitamin C, ethanol and other minerals. All parts of the tree have a medicinal use including fruits, seeds, barks and roots. The most important is steroidal saponins, which yield diosgenin, a source of steroidal drugs, such as corticosteriods, contraceptives and sex hormones (Ajayi, Ajoke. 2013) [2].

Cassytha filiformis

Cassytha filiformis (common name; "Love vine") is a plant used for various ethno medical purposes in Nigeria. The "Love vine" is usually found as a cosmopolitan in the region of tropics but sometimes becomes a pest of economic importance because of its attachment to the valuable orchard trees and other ornamental plants by means of its tough threadlike extensive branchlets. This plant is considered to be unique in the family of Lauraceae as it is a parasite. Because of the nature of its particular characteristics, it is taxonomically classified in a separate tribe.

Evaluation of this plant is based on its traditional use by a substantial population in the Northern part of Nigeria for the treatment of diseases such as diabetes. In the Northern part of Nigeria, the plant (stem and leaves) is boiled with red potash in water and administered for varying lengths of time to treat *Diabetes mellitus*. This rootless parasitic plant is also administered for the relief of ulcer, veneral discharges, haemorrohoids, cough, and other things (Hausatu *et al.* 2007).

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Cassytha filiformis is a leafless, perennial, climbing, twinning, vine-like, authoparasitic and plant- hyperparasitic phanerogram (seed-bearing plant) in the plant family *Lauraceae.* The stems, which are green to orange, filiform and glabrous are long and thread like, measuring 3-8m in length, grows in a triangle on hosts. Flowers are sessile and few in spicate inflorescence 1-2cm long. *Cassytha filiformis Linn* inhabits coastal vegetation, usually on sandy dunes, margins of evergreen gully and venerin forests, deciduous and coastal woodlands, montane grassland and dambo margins and vegetation of sandy beaches or lakes. It grows on small bushes, woods shrubs and low tree, grasses and herbaceous weeds. Its seeds might be dispersed by animals, man, water, strong winds, and farm machinery. They parasitize other plants by specialized attachment and penetration with feeding structures known as *haustoria*. According to, "this plant is distributed throughout India and is used for medicinal purposes in China, Madgascar and South Africa (Adonu *et al.* 2013*).*

Boswellia dalzielii

Boswellia dalzielii is a tree plant. It is abundantly found in north-western Nigeria, where the Hausa speaking people refer to it as *Hannu* or *Harrabi*. This plant is very popular among the locals as a potent source of ethnomedicine. The extract from its leaves is used for the treatment of diarrhea in poultry. The root decoction of *Boswellia dalzielii* and *Daniella oliveri* is used for wound healing. The fresh bark is eaten to induce vomiting and relieve symptoms of giddiness and palpitations. The root decoction of the plant boiled along with *Hibiscus sabdariffa* is used for the treatment of syphilis. (Atawodi *et al.,* 2011) [4]

Materials and Method

Plant collection and extraction

The stem bark of *Balanites aegyptiaca, Cassytha filiformis and Boswellia dalzielii* were collected from panbeguwa in Kaduna state, Nigeria. The plants were identified in the Department of Biological science, Ahmadu Bello University, Nigeria with voucher numbers 2064, 2841 and 900121 respectively. The barks were cleaned, air-dried for 2 weeks and then pounded into coarse powder. Extraction was carried out using soxhlet extractor.

Procedure for soxhlet extraction

3-4 boiling chips were placed in a clean and dry round bottomed flask**.** A measured quantity of the powdered sample was transferred into an extraction thimble**.** The extraction thimble was covered using a fat-free glass wool**.** Methanol and petroleum ether were transferred into the solvent vessel (round bottomed flask)**.** Extraction was carried out at temperature of 110-130oC 36

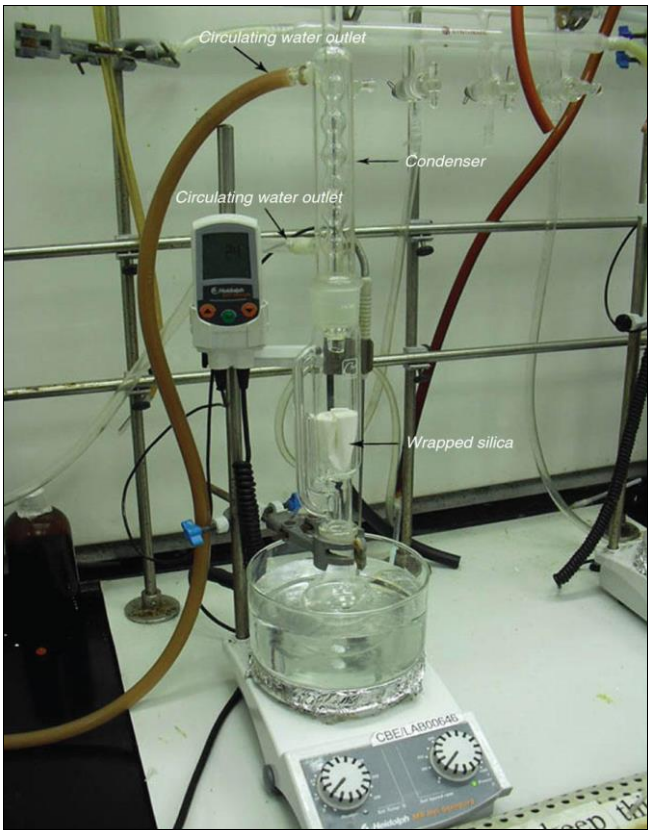

Fig 1: A set up of soxhlet extractor 37

Experimental Animals

Male wistar albino rats of weights between 120-250g body weights were used for the experiment. They were fed *ad libitum* with standard feed (growers feed) and allowed free access to water. The animals were acclimated to housing condition freely prior to the commencement of administration. The body weight of each rat was assessed using a sensitive balance during the acclimatized period, once before commencement of dosing, once weekly during the dosing period, and once on the day of sacrifice. Administration lasted for 21 days. During the 3 weeks of dosing, all the animals were observed daily for clinical signs and mortality patterns. They were starved overnight and resume feeding immediately after administration.

Groupings of animals

50 rats, selected by stratified randomisation, were used for the study. They were divided into four groups of five (5). The first group served as a control and were given equivalent volumes of injection water while the remaining nine (9) groups were orally administered 50, 100 200mg/kg bw of methanol extract of *Balanites aegyptiaca;* 50, 100, 200 mg/kg bw of methanol extract of *Cassytha filiformis*; and 50, 100, 200 mg/kg bw of methanol extract of *Boswellia dalzielii* respectively, for 21 days. The physical appearances and activities of the rats were observed daily.

Table 1: Groupings of animals

Groups	Group Code	Dose mg/kg bw
Control	1	0
Balanites aegyptiaca	2	50
Balanites aegyptiaca	3	100
Balanites aegyptiaca	4	200
Cassytha.filiformis	5	50
Cassytha filiformis	6	100
Cassytha filiformis	7	200
Boswellia dalzielii	8	50
Boswellia dalzielii	9	100
Boswellia dalzielii	10	200

After 21 days of drug exposure, the animals were weighed and exsanguinated under chloroform anaesthesia. Blood samples were drawn from the heart of each sacrificed animal. For the lipid profile study, blood samples of the five animals in each group were collected. The samples were collected in plastic test tubes and allowed to stand for 3 hours to ensure complete clotting. The clotted blood samples were centrifuged at 3000 rpm for 10 mins, and clear serum samples were aspirated off and stored frozen. Lipid profile parameters [Total Cholesterol (TC), Total triglyceride (TG) and High Density Lipoprotien (HDL)] were analyzed in the laboratory using auto analyzer machine.

Data generated are expressed as means ± SD. The statistical comparisons were performed using the one way ANOVA test. The results were considered statistically significant at $P \leq 0.05$.

Result and Discussion

Total Cholesterol

Effect of Balanites aegyptiaca

From figure 2 below, concentration of total cholesterol in animals administered with *Balanites aegyptiaca* extract at doses 50 and 200mg/kg body weight are significantly different ($P \leq 0.05$) from the control group, but at 100mg/kg body weight, it has no significant difference ($P \leq 0.05$) with the control group. There is decrease in the concentration of total cholesterol in the animal treated with 50mg/kg dose but level increases with increase in the dose and decreases at 200mg/kg dose.

Effect of *Cassytha filiformis*

From figure 1, the concentration of total cholesterol in animals administered with *Cassytha filiformis* extract at doses 50 and 100mg/kg body weight showed no significant difference ($P \leq 0.05$) with each other but are significantly different ($P \leq 0.05$) from the control. Result at 200mg/kg bodyweight dose showed significant difference ($P \leq 0.05$) compared with animals administered at doses 50 and 100mg/kg and also significantly different ($P \leq 0.05$) from the control group.

Effect of *Boswellia dalzielii*

The concentration of total cholesterol in animals administered with *Boswellia dalzielii* extract at doses 50 and 100mg/kg showed less significant difference ($P \leq 0.05$)with each other but they are significantly different ($P \leq 0.05$) from the control group. At dose of 200mg/kg there is high significant difference ($P \leq 0.05$) as the dose decreases but less significantly different ($P \leq 0.05$) compared with the control.

Comparing the three extracts, it was observed that concentration of total cholesterol in animals administered with *Balanites aegyptiaca* at dose 50mg/kg, *Cassytha*

filiformis at dose 50 and 100mg/kg, *Boswellia dalzielii* at dose 50 and 100mg/kg has little or no significant difference (P≤0.05) but are significantly different (P≤0.05) from the control. However, All the extracts at doses of 200mg/kg bw are less significantly different (P≤0.05) from the control compared with other doses.

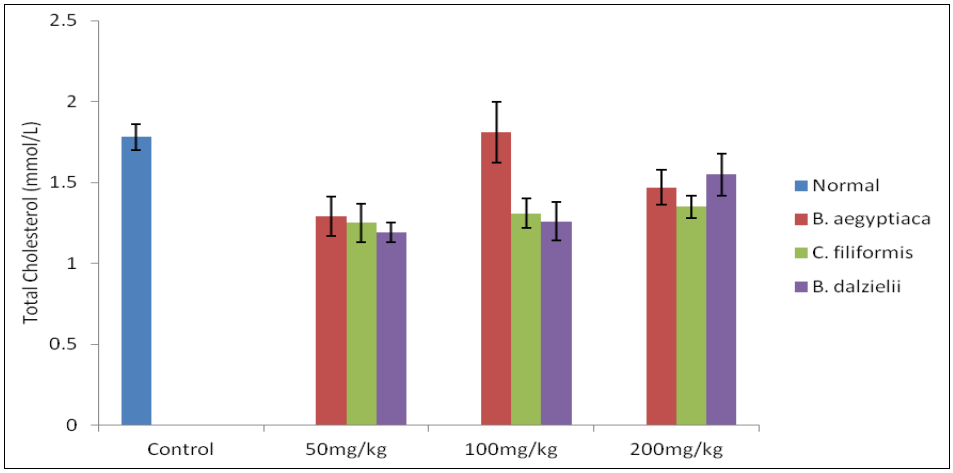

Fig 1: Total Cholesterol levels of rats treated with methanolic stem bark extracts of *Balanites aegyptiaca*, *Cassytha filiformis* and *B. denzielii*. Values are presented as mean ± SD, (n=5) for each group. Values are statistically significant compared to control group at p <0.05.

Total Triglyceride

Effect of *Balanites aegyptiaca*

From figure 3 below, concentration of total triglyceride in animals administered with *Balanites aegyptiaca* at doses 50 and 200mg/kg body weights showed no significant difference (P≤0.05) with each other and are less significantly different (P≤0.05) from the control. At dose 100mg/kg body weight, there is no significant difference (P≤0.05) from control.

Effect of *Cassytha filiformis*

From the figure 3, concentration of total triglyceride in animals administered with *Cassytha filiformis* at doses 50 and 200mg/kg body weight showed no significant difference (P≤0.05) from each other but is significantly different (P≤0.05) from the control. At dose 100mg/kg there was significant difference (P≤0.05) compared with other doses and also significantly different (P≤0.05) from the control.

Effect of *Boswellia dalzielii*

From the figure, concentration of total triglyceride in animals administered with *B. dalzielii* at doses 50 and 100mg/kg body weight showed no significant difference (P≤0.05) but is significantly different (P≤0.05) from the control. At dose 200mg/kg, there was significant difference (P≤0.05) compared with other doses but showed no significant difference (P≤0.05) with the control.

Comparing the three extracts, it was observed that concentration of total triglyceride in animals administered with *Balanites aegyptiaca* at dose 50 and 200mg/kg, *Cassytha filiformis* at dose 50 and 200mg/kg, *B.dalzielii* at dose 100mg/kg have no significant difference (P≤0.05) but are significantly different (P≤0.05) from the control. *Boswellia dalzielii* at dose 50mg/kg and *Balanites aegyptiaca* at dose 100mg/kg are significantly different (P≤0.05) from other doses but they have no significant difference (P≤0.05) with the control. *Cassytha filiformis* at dose 100mg/kg and *B.dalzielii* at dose 200mg/kg are also significantly different (P≤0.05) from the control.

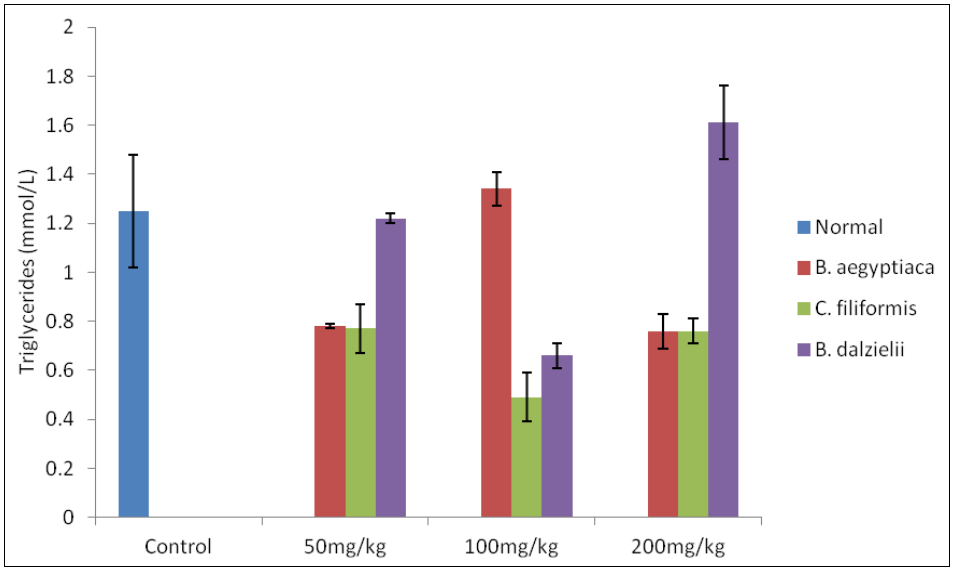

Fig 4: Triglycerides levels of rats treated with methanolic stem bark extracts of *Balanites aegyptiaca*, *Cassytha filiformis* and *B. denzielii*. Values are presented as mean ± SD, (n=5) for each group. Values are statistically significant compared to control group at p <0.05

High Density Lipoprotein (HDL)

Effect of *Balanites aegyptiaca*

From figure 4 below, it was observed that concentration of High Density Lipoprotein in animals administered with *Balanites aegyptiaca* extracts at all doses are significantly different from the control.

Effect of *Cassytha filiformis*

It was observed that the concentration of High Density Lipoprotein in animals administered with *Cassytha filiformis* extract at all doses is also significantly different from the control.

Effect of *Boswellia dalzielii*

It was observed concentration of High Density Lipoprotien in animals administered with 50 and 100mg/kg doses of the extract showed no significant difference (P≤0.05) but are significantly different (P≤0.05) from the control. At dose 200mg/kg there was significant difference (P≤0.05) compared with other doses but has no significant difference (P≤0.05) compared with the control.

Concentration of High Density Lipoprotein in animals administered with the different extracts, was observed that only *Balanites aegyptiaca* extract at dose 50mg/kg and *Boswellia dalzielii* at dose 200mg/kg showed no significant difference (P≤0.05) with the control but other doses are significantly different (P≤0.05) from the control

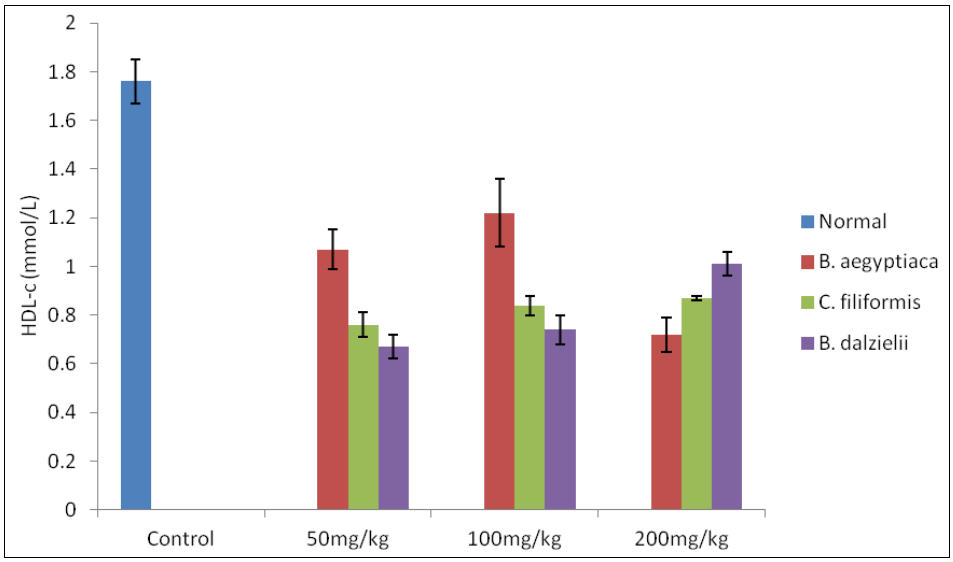

Fig 4: High density lipoprotein cholesterol levels of rats treated with methanolic stem bark extracts of *B. aegyptica*, *Cassytha filiformis* and *B. denzielii.* Values are presented as mean ± SD, (n=5) for each group. Values are statistically significant compared to control group at p <0.05

Discussion

There was an observed decrease in total cholesterol in animal treated with *Balanites aegyptiaca* stem bark extract at dose 50mg/kg body weight, increase in the dose caused an increase in the concentration of total cholesterol. Therefore stem bark extract of *Balanites aegyptiaca* administered at a low dose may have an anti-lipidemic effect. This is a concern because high level of cholesterol contributes to cardiovascular diseases (Hausatu *et al*. 2007).

It was also observed that administration of methanolic extract of *Cassytha filiformis* at all doses caused a decrease in total cholesterol concentration when compared with the control. This is in contrast to the research carried out by Hausatu *et al, 2007,* who investigated the effect of aqueous extracts on animal and reported that all the exposed rats showed an elevation in cholesterol levels. This contrast observed could be explained on the basis of effect of different constituents present in different solvent extracts.

Boswellia dalzielii had less effect on the level of total cholesterol concentration when compared with control. There was slight decrease in the level of cholesterol at all the doses (fig 4.1). This showed that stem bark extract of *B. boswellia* has little or no effect on level of cholesterol. Increase in cholesterol occurs in Nephrotic syndrome, Diabetes mellitus, Obstructive jaundice, Coronary thrombosis, Hypothyroidism. Decrease in cholesterol may occur in pernicious anaemia, Haemolytic anaemia, malabsorption syndrome, acute infections, Terminal illness, Hyperthyroidism etc. (Atawodi *et al.*, 2011) [4]

Balanites aegyptiaca had no effect on the increase or decrease in the level of total triglyceride with reference to the control value at all doses. *Cassytha filiformis* was also observed to slightly decrease the concentration of serum total triglyceride. *B. dalzieli* was observed to cause no significant effect on the level of total triglyceride.The concentration of total triglyceride increased with increase in the dosage at 200mg/kg body weight, suggesting an hyper-lipidemic effect. In the human body, high levels of triglyceride in the blood stream lead to hypertriglyceridemia which have been linked with atherosclerosis (thickening of the artery walls) and by extension, the risk of heart disease and stroke. (Atawodi *et al.*, 2011) [4]

It was observed that animal treated with *Balanites aegyptiaca* at high dose (200mg/kg) have decreased concentration of HDL with reference to the control. *Cassytha filiformis* have less significant effect on the level of HDL, high decrease in the concentration of HDL was observed at the lowest dose. There was reduced level of HDL concentration in animal treated with

Boswellia dalzielii at lower doses but increases with higher dose. Role of HDL in reverse cholesterol transport system is to regulate the concentration of cholesterol in other body tissues by transporting cholesterol from other tissues of the body to the liver. Because HDL performs this transport, it is

referred to as good cholesterol, being able to reduce the concentration or accumulation of cholesterol thereby reducing risks of diseases associated with hypercholesterolaemia. (Nwinyi *et al.,* 2004) [15]

Conclusion

From the results, it could be concluded that:

1. Methanolic extracts of *Balanites aegyptiaca, Cassytha filiformis and Boswellia dalzielii* orally administered in male wistar rats at different dose levels (50, 100, 200mg/kg body weight) generally have little or no significant($p<0.05$) effect on level of lipid profile parameters analyzed. *Cassytha filiformis* was observed to have the highest anti-lipidemic activity among the three plants.
2. The result demonstrated that anti-lipidemic effect of *Cassytha filiformis* extract was at 50mg/kg. Concentration of total cholesterol in the animals administered with *Cassytha filiformis* were 1.25, 1.31, 1.35mmol/L respectively, total triglyceride concentrations at doses 50, 100 and 200mg/kg were 0.77, 0.49 and 0.76mmol/L respectively and HDL values at doses 50, 100 and 200mg/kg respectively were 0.76, 0.76 and 0.87mmol/L respectively. These values showed decrease in the level of lipid profile parameters when compared with the normal control results which has total cholesterol, triglyceride and high density lipoprotein values 1.78, 1.25, 1.76mmol/L respectively.

Recommendation

From results obtained and conclusions on this study, I recommend that further research should be carried out on the acute effect of *Balanites aegyptiaca*, *Cassytha filiformis and Boswellia dalzielii* of extracts on lipid profile.

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