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Pregnancy outcome in rats following adminstration of *Icacinia manni* tuber

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Abstract
Icacinia manni is a wild shrub abundantly found in most part of Africa with a unique ball-shaped underground tuber giving it its vernacular name, Earth Ball. There are reports that it is consumed directly or indirectly by man because of its high carbohydrate content. This study investigates the metabolic effect of *Icacinia manni* on pregnancy outcome. A total of 36 rats (24 females and 12 males), were used for this study. Twenty-four (24) female rats, weighing between 80 and 100gm were randomly sorted into two groups, A and B, of 12 rats in each group. Group A was given distilled water by mouth and allowed liberal food and water. Group B was given high dose extract (i.e. 3/10 x LD_{50} = 3/10 x 894.43 = 268.32mg/kg). They were also allowed liberal food and water intake throughout the period of three (3) weeks. Extract was given once daily by mouth for this period. Twelve male rats weighing between 80 and 100mg were sorted into two groups, randomly of 6 rats per group (A1 and B1). Liberal food and distilled water was allowed for Group A1 for the period of three (3) weeks. To the rats in group B1, high dose extract (268.32mg/kg) was given once daily by oral gavage. The animals were allowed liberal food and water and good ventilation for three (3) weeks. The animals were randomly sorted into four (4) mating groups. Group 1(control): Six (6) female fed with distilled water and three (3) males fed with distilled water. Group 2: Six (6) females fed with water and three (3) males fed with extract. Group 3: Six (6) female fed with extract and three (3) males fed with water. Group 4: Six (6) females fed with extract and three (3) males fed with extract. Mating was allowed for two cycles of 8 days after which the males were separated from the females. The females were observed weekly for weight gain; pregnancy and parturition. The animals were observed for a period of nine (9) weeks after mating. Duration of pregnancy, number of litters per delivery and weight of the offspring were recorded. For ease of analysis, duration of pregnancy was defined as period from separation of male rats to time of delivery. At the end of the nine (9) weeks the animals were anaethesized by chloroform and sacrificed to rule out pregnancy. They were dissected to obtain blood samples by cardiac puncture for biochemical analysis of Lipid profile and Serum protein. The livers and ovaries were harvested for histological analysis. Result showed that females receiving extracts had significantly less ($p>0.05$) number of litters per pregnancy as well as lower birth weight. Females receiving extracts also had prolonged duration of pregnancy. Pregnant animals that received the extract had lower levels of Total Cholesterol, Triglycerides, High Density Lipoproteins as well as Low Density Lipoproteins than pregnant animals placed on distilled water (control). Pregnant animals treated with the extracts also had significantly lower ($p>0.05$) Total serum proteins, Serum Albumin and globulin when compared with control group. Damage on the liver and ovary was also revealed by the histology. We conclude that administration of ethanolic extract of *Icacinia manni* affected pregnancy outcome in rats, probably due to the effect of this extract on lipids and serum protein synthesis and metabolism.

Keywords: *Icacinia manni*, pregnancy outcome, serum protein, lipid profile

1. Introduction
Icacinia manni is a wild shrub abundantly found in most part of Africa with a unique ball-shaped underground tuber giving it its vernacular name, Earth Ball. The tuber is observed to be a source of energy as it contains high amount of carbohydrates among other nutritional constituents. This however being the reason for its use as alternative for energy sources in feeds and foods.

Recently, Poultry Animal Scientists have investigated on the use of *Icacinia manni* tuber in chicken feeds to substitute for maize as energy source [1]. The outcome of the investigation on chicken performance was not satisfactory and this limited its use. Works on improving the content of the tuber by fermentation and toasting to reduce the antinutrient effects have been carried out with no satisfactory outcome. Asuquo and Udedibie [2] concluded that dietary toasted *Icacinia manni* tuber (earth ball) meal could not be tolerated by laying hens even at 10% dietary level.

Also, *Icacinia manni* tuber has been observed to be consumed by man. There are reports of its use in treatments of some diseases. It is also reported to be used in adulterating garri during lean times. Yet, its effect on the body system is limited to just our recent study, in Udokang *et al.*, 2019 [3] on the reproductive outcome in male rats.

Pregnancy as a process which aimed at live birth, sometimes does not present itself in a normal pattern, like in spontaneous abortion, delayed pregnancy, weight of litters, etc. In most cases, the causes are unknown, thereby making it difficult to tackle. Also, being a process that is genetically constituted by two different living entities, it may be difficult to apprehend if the cause is due to the male or female factor or both.

The idiopathic nature of some of these pregnancy defects have pointed at the intake of some toxic substances in foods since nutrition is inevitable. The intake of this substances mostly unknowingly by the consumers may be directly or indirectly. *Icacinia manni* tuber may have been consumed by many directly, as in disease treatments and when used in adulterating garri or indirectly when eating meats from

livestock fed with it.

Apart from containing carbohydrates, proteins, lipids, etc, *Icacinia manni* tuber has been observed to contain many other antinutrients: cyanide, alkaloids, phytic acid, oxalic acid and tannins [1].

However, our interest is drawn to the effects in which the consumption of this plant tuber may cause on the body system and the possible pregnancy outcome since the antinutrients in it have been observed to adversely affect the body system. The recent work by same authors on this tuber confirms that it caused structural damage to gonadonal tissue [3].

Metabolism and pregnancy have been linked. Some metabolic defects have been observed to alter pregnancy outcome and usually affect both the mother and the offspring. In this study, the mechanism of this link and the outcome on pregnancy is of essence.

1.1 Purpose of Study

This study was conducted to examine the metabolic effects of the ethanolic extract of *Icacinia manni* tuber on female rats and the overall outcome on pregnancy. Emphases are on the following parameter;

1. Lipid profile
2. Serum protein
3. Liver histology
4. Ovarian histology
5. Number of litters
6. Weight of litters
7. Duration of pregnancy

1.2 Significance of Study

As a follow up, it is pertinent to confirm the antifertility effects of *Icacinia manni* tuber observed in our recent work in rats [3] and in the chickens by Asuquo and Udedibie [2]. The mechanism of the link between metabolism and pregnancy outcome is also an important area of concern.

2. Methodology

2.1. Collection, Identification of Icacinia manni

Icacinia manni has two parts - The leafy shrub on the outside and the tuber underground. The plant with tuber, leaves and stem was harvested from the bush in Uyo, Akwa Ibom state of Nigeria, and identify by the Department of Botany, University of Uyo, Nigeria. This research work made use of the tuber. The leaves and stem were discarded.

2.2. Preparation and Extraction of Icacinia manni

The tuber was washed with water to remove sand, cut into pieces and sun dried. The dried specimen was sent to department of pharmacognosy, University of Uyo, Nigeria for extraction with 80% Ethanol.

2.2.1. Maceration

After two (2) weeks of drying the tuber was reduced into powder. The powder was divided into two parts. One part was macerated in 80% ethanol for 72hrs to give the crude ethanolic extract. The other part was successively macerated for 72hrs in n-hexane and ethanol to give the corresponding gradient fraction of these solvents. The liquid filtrate was concentrated and evaporated to dryness using rotary evaporator. The creamy liquid collected from the filtrate turned brownish and thick after concentration to dryness. The pure extract was stored in a refrigerator at 4°C pending when it will be used for the proposed study.

2.2.2. Preparation of Stock Concentration

The stock solution was prepared using std procedures.

2.3. Experimental Animals

Four (4) weeks old Wistar rats were used for this study. The rats were obtained from the animal house of the Department of Physiology, University of Calabar and kept in a well-ventilated experimental section of the animal house of the faculty of Pharmacy, University of Uyo, Uyo.

The animals were fed and kept for 7 days to acclimatize before the experiment began. They were kept in wooden cages and fed with rat chow from vital feeds. They were allowed free access to drinking water throughout the experimental period.

2.4. Determination of Median Lethal Dose (LD50)

The median lethal dose (LD50) of the extract was estimated using albino Wistar mice by intra peritoneal (ip) route using the method of Lorke (1983) [4].

2.5. Experimental Procedures

A total of 36 rats (24 females and 12 males), were used for this study. Twenty-four (24) female rats, weighing between 80 and 100gm were randomly sorted into two groups, A and B, of 12 rats in each group. Group A was given distilled water by mouth and allowed liberal food and water. Group B was given high dose extract (i.e. 3/10 x LD_{50} = 3/10 x 894.43 = 268.32mg/kg). They were also allowed liberal food and water intake throughout the period of three (3) weeks. Extract was given once daily by mouth for this period.

Twelve male rats weighing between 80 and 100mg were sorted into two groups, randomly of 6 rats per group (A1 and B1). Liberal food and distilled water was allowed for Group A1 for the period of three (3) weeks. To the rats in group B1, high dose extract (268.32mg/kg) was given once daily by oral gavage. The animals were allowed liberal food and water and good ventilation for three (3) weeks.

All animals were weighed weekly. Females were observed for onset of estrous. At the end of the 3 weeks the females were allowed to mate at estrous. The animals were randomly sorted into four (4) mating groups.

Group 1(control): Six (6) female fed with distilled water and three (3) males fed with distilled water.

Group 2: Six (6) females fed with water and three (3) males fed with extract.

Group 3: Six (6) female fed with extract and three (3) males fed with water.

Group 4: Six (6) females fed with extract and three (3) males fed with extract.

Mating was allowed for two cycles of 8 days after which the males were separated from the females.

The females were observed weekly for weight gain; pregnancy and parturition. The animals were observed for a period of nine (9) weeks after mating. Duration of pregnancy, number of litters per delivery and weight of the offspring were recorded. For ease of analysis, duration of pregnancy was defined as period from separation of male rats to time of delivery.

2.6. Sample Collection

At the end of the nine (9) weeks the animals were anaethesized by chloroform and sacrificed to rule out

pregnancy. They were dissected to obtain blood samples by cardiac puncture for biochemical analysis. The livers and ovaries were harvested for histological analysis. Approval was gotten from the Local Research Ethical Committee of the University of Uyo, Uyo, Akwa Ibom State, Nigeria.

2.7. Analysis

2.7.1. Biochemical Analysis

The collected blood was allowed to clot and centrifuged at 300rev per minutes for 20mins. The serum was collected with the aid of a micropipette for lipid profile and serum protein levels analysis.

The plasma concentration of Total Cholesterol, Triglycerides, High Density Lipoprotein Cholesterol and Low Density Lipoprotein Cholesterol were measured using spectrophotometric methods. Laboratory kit reagents (Randox Laboratory Ltd, UK) were used for all biochemical analysis and their absorbance were read using a UV-Vis spectrophotometer (DREL 3000 HACH); using standard protocols for serum albumin and globulin

2.7.2. Histological Analysis

The livers and ovaries were immediately immersed in Bouin's solution for fixation and processed until embedded in paraffin for histological analysis. Five micron thick sections were prepared using microtome (microTecLaborgerate GmbH Rudolf-Diesel-Straβe, Walldorf, Germany) and stained using Hematoxylin and Eosin (H&E) method. The specimens were examined under Olympus/3H light microscope-Japan.

2.7.3. Statistical Analysis

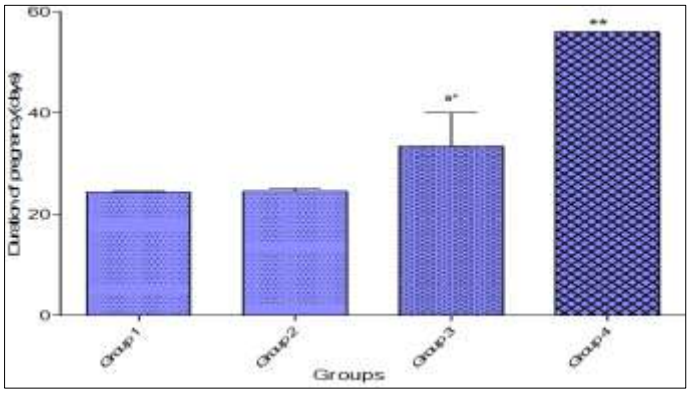
Data obtained were analyzed using Mean, Standard Error of Mean and Analysis of Variance followed by Duncan's test which was used to determine the direction of significance. The results were reported in the form mean ± SEM and statistical significance was established at 0.05 level of significance with $p<0.05$ signifying significance. Data were analyzed using the Statistical Package for Social Sciences (SPSS version 22.0) and GraphPad Prism 5.0.

3. Results

Keys

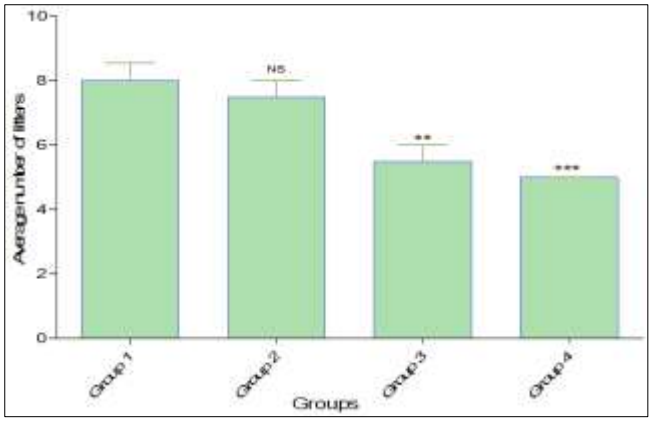
Group 1-Female (Distilled water) + Male (Distilled water)
Group 2-Female (Distilled water) + Male (Extract)
Group 3-Female (Extract) + Male (Distilled water)
Group 4-Female (Extract) + Male (Extract)

3.1 Inter-group graphical comparison of the effect of oral administration of *Icacinia manni* tuber on Pregnancy outcome



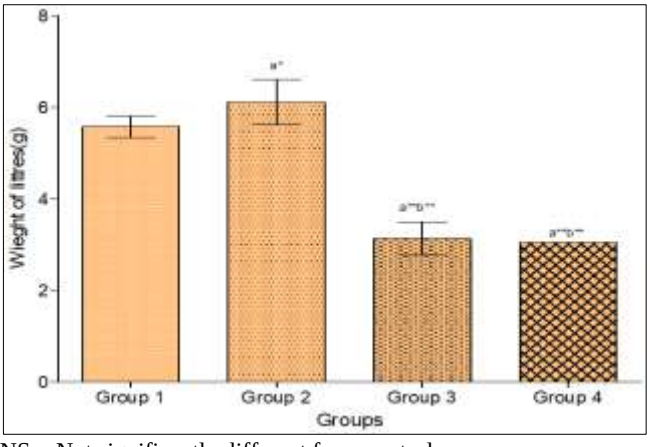
A* = significantly different (P< 0.05) when compared to Control group.
**= statistically significant when compared to Control group, group 2 and group 3.

Fig 1: Effect of oral administration of Icacinia manni extract on duration of pregnancy in female Wistar rats.



NS = Not significantly different from control.
* = significantly different (P< 0.05) Vs Control. ** =P< 0.01 Vs (control). *** =P< 0.001 Vs (control).

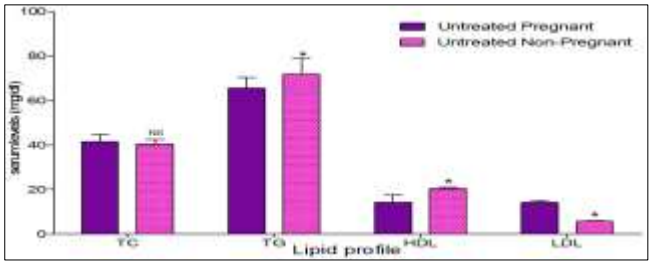
Fig 2: Effect of oral administration of Icacinia manni extract on number of litters of female Wistar rats.



NS = Not significantly different from control.
A* = P< 0.05 Vs (Control). A** = P< 0.01 Vs (control). B**= P< 0.01 Vs Low-dose group. *** =P< 0.001

Fig 3: Effect of oral administration of Icacinia manni extract on weight of litters of female Wistar rats.

3.2 Graphical comparison of the effect of oral administration of *Icacinia manni* extract on lipid profile in female Wistar rats.



UFP = Untreated female pregnant; UFNP = Untreated female non pregnant
NS = not significantly different from UFP; * = significantly different ($p<0.05$) from UFP Keys: TC- Total cholesterol; TG- Triglycerides; HDL- High density lipoprotein; LDL- Low density lipoprotein.

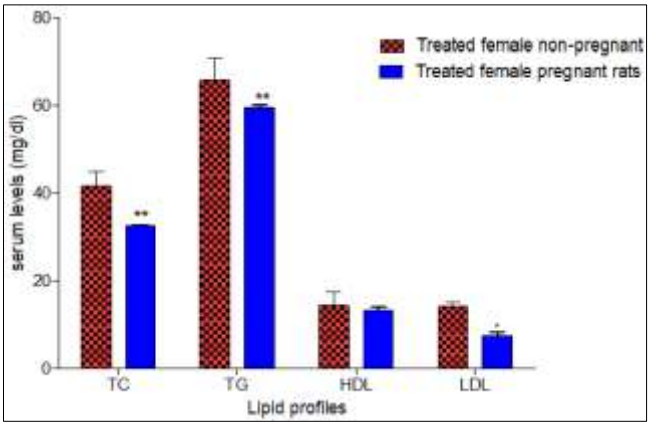
Fig 4: Effect of oral administration Icacinia manni extract on lipid profile of untreated female pregnant /untreated female non-pregnant rats.

Total cholesterol - TC
The mean TC for untreated female pregnant was not significantly different ($p>0.05$) from untreated female non pregnant.

Triglycerides - TG
The mean TG for untreated female pregnant was significantly lower ($p<0.05$) than that of the untreated female non-pregnant.

High density lipoprotein - HDL
The mean HDL for untreated female pregnant was significantly lower ($p<0.05$) than untreated female non-pregnant.

Low density lipoprotein - LDL
The untreated female pregnant rats showed a significant higher ($p<0.05$) mean LDL than the untreated female non-pregnant rats. See figure 14.



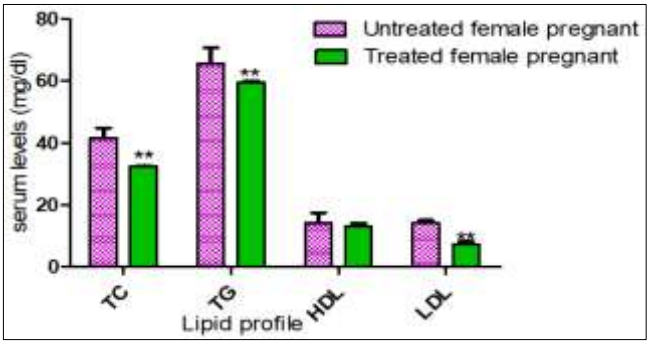
Keys: TC- Total cholesterol**; TG-** Triglycerides; **HDL-** High density lipoprotein**; LDL-** Low density lipoprotein.
**= significantly different ($p<0.01$); * = significantly different ($p<0.05$).

Fig 5: Effect of oral administration of Icacinia manni extract on lipid profile of treated female non-pregnant (TFNP) and treated female pregnant (TFP) Wistar rats.

Total cholesterol
The treated female non-pregnant rats showed a significant increase ($p<0.01$) in mean total cholesterol levels compared to the treated female pregnant. Triglycerides - TG
There was a significant decrease ($p<0.05$) in the mean TG levels of treated female pregnant when compared to treated female non-pregnant rats.

HDL
The mean HDL levels for the treated female non-pregnant rats had no significant difference ($p>0.05$) when compared to that of the treated female pregnant rats.

LDL
The mean LDL for treated female non-pregnant was significantly higher than that of treated female pregnant.



Keys: TC- Total cholesterol**; TG-** Triglycerides; **HDL-** High density lipoprotein**; LDL-** Low density lipoprotein.

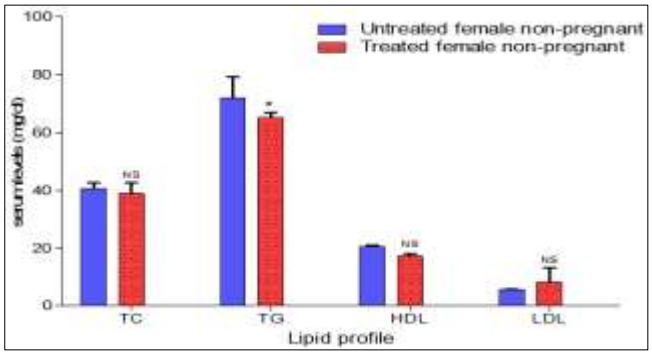
Fig 6: Effect of oral administration of Icacinia manni extract on lipid profile of untreated Vs treated female pregnant Wistar rats.
NS = not significantly different from UFP; * = significantly different ($p<0.05$) from UFP.

Total cholesterol - TC
The mean total cholesterol levels of treated female pregnant decreased significantly ($p<0.001$) when compared to untreated female pregnant rats

Triglycerides - TG
TG levels of treated female pregnant decreased significantly ($p<0.05$) when compared to untreated female pregnant rats

HDL
There was no significant difference in HDL levels of untreated female pregnant rats and that of treated female pregnant.

LDL
The mean LDL levels of treated female pregnant decreased significantly ($p<0.001$) when compared to untreated female pregnant rats.



Keys: TC- Total cholesterol**; TG-** Triglycerides; **HDL-** High density lipoprotein**; LDL-** Low density lipoprotein.

Fig 7: Effect of oral administration of Icacinia manni extract on lipid profile of untreated Vs treated female non-pregnant (UFNP AND TFNP) Wistar rats. NS = not significantly different from TFNP; ** = significantly different ($p<0.01$)

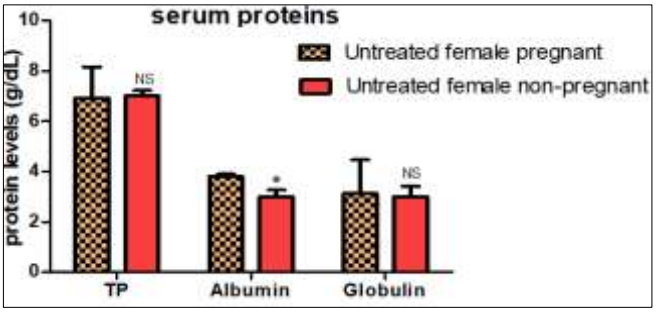
Total cholesterol
The mean total cholesterol levels of untreated female non-pregnant rats (40.48 ± 2.09) and treated female non-pregnant rats (38.77 ± 3.80) was not significantly different ($P>0.05$).

Triglycerides - TG
The mean TG levels of treated female non-pregnant rats significantly reduced ($p<0.05$) compared to that of untreated non-pregnant rats.

HDL
Untreated female non-pregnant rats showed no significant difference ($p>0.05$) when compared to the mean HDL of treated female non-pregnant rats.

LDL
The mean LDL levels of the treated female non-pregnant was not significantly different ($p<0.05$) from that of untreated female non-pregnant.

3.3 Graphical comparison of the effect of oral administration of *Icacinia manni* extract on serum protein in female Wistar rats.



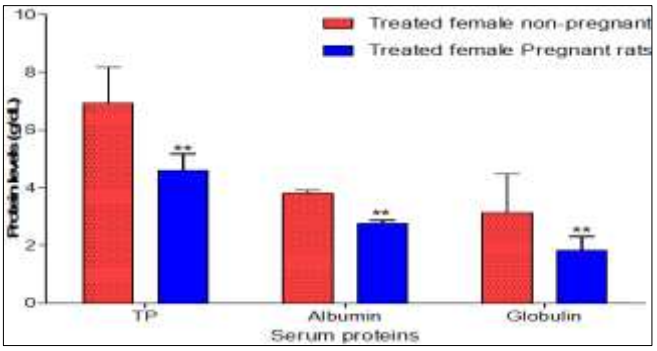
Key: TP- Total Protein
NS= Not significantly different. *=significantly different ($p<0.05$) from untreated female pregnant.

Fig 8: Effect of oral administration Icacinia manni extract on serum proteins of untreated female pregnant /untreated female non-pregnant rats.

Total protein
The mean total protein for untreated female non-pregnant was not significantly different from that of the untreated female pregnant.

Albumin
The mean Albumin level for the untreated female non-pregnant was significantly lower ($p<0.05$) than that of the untreated female pregnant.

Globulin
There was no significant difference ($p>0.05$) in the globulin levels between untreated female pregnant and untreated female non- pregnant.



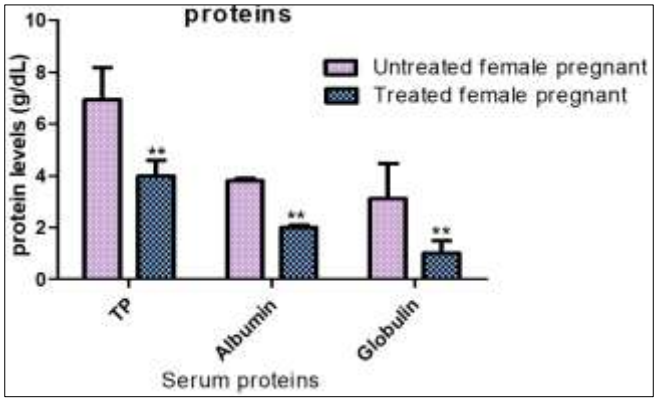
Key: TP- Total Protein

Fig 9: Effect of oral administration of Icacinia manni extract Serum proteins of treated female non-pregnant (TFNP) and treated female pregnant (TFP) Wistar rats. ** = significantly different ($p<0.001$).

Total protein
The mean total protein levels of treated female non-pregnant rats significantly increased ($p<0.001$) compared to that of treated female pregnant rats.

Albumin
The mean albumin for treated female non-pregnant significantly increased ($p<0.05$) compared to that of the treated female pregnant.

Globulin
There was a significant increase ($p<0.01$) in the mean globulin levels of treated female non-pregnant when compared to the treated female pregnant.



Key: TP- Total Protein

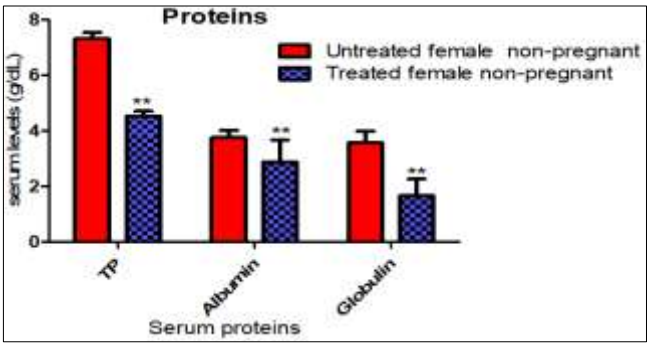
Fig 10: Effect of oral administration of Icacinia manni extract on serum proteins of untreated Vs treated female pregnant Wistar rats. **=significantly different ($p<0.05$) from untreated female pregnant rats.

Key: TP- Total Protein

Total protein
The mean total protein levels for treated female pregnant rats was significantly lower ($p<0.05$) than that of untreated female pregnant rats.

Albumin
The mean albumin levels for treated female pregnant rats was significantly lower ($p<0.05$) than that of untreated female pregnant rats.

Globulin
The mean globulin levels for treated female pregnant rats was significantly lower ($p<0.05$) than that of untreated female pregnant rats.



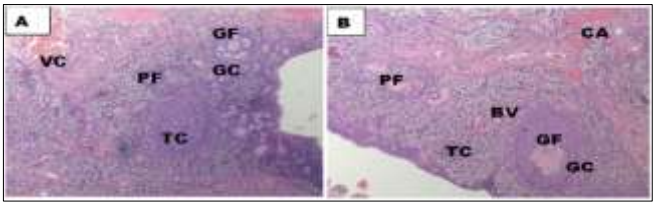
Key: TP- Total Protein

Fig 11: Effect of oral administration of Icacinia manni extract on serum protein of untreated Vs treated female non-pregnant (UFNP AND TFNP) Wistar rats.

Total protein (TP)
The TP levels in the treated female non-pregnant decreased significantly ($p<0.05$) when compared to the untreated female non-pregnant rats.

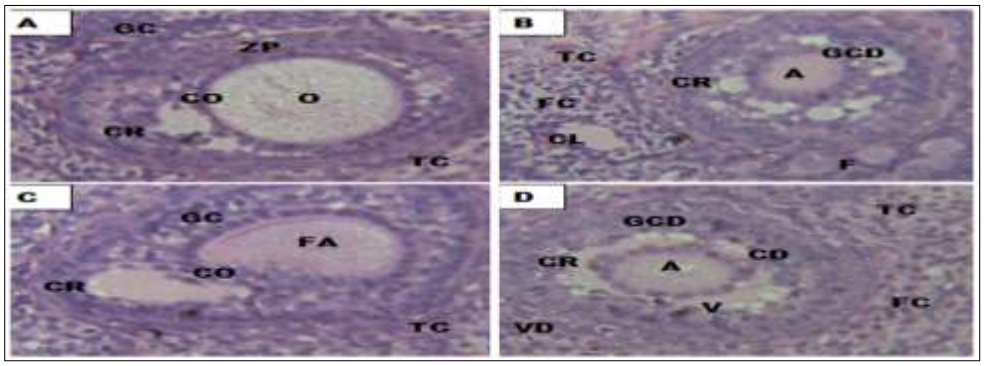
Albumin and Globumin
The albumin for untreated female non-pregnant was significantly higher ($p<0.05$) than of treated female non-pregnant. The mean globulin levels in treated female non-pregnant rats was significantly lower ($p<0.01$) than that of untreated female non-pregnant rats.

3.4 Histology of the ovary following oral administration of *Icacinia manni* extract in Wistar rats.



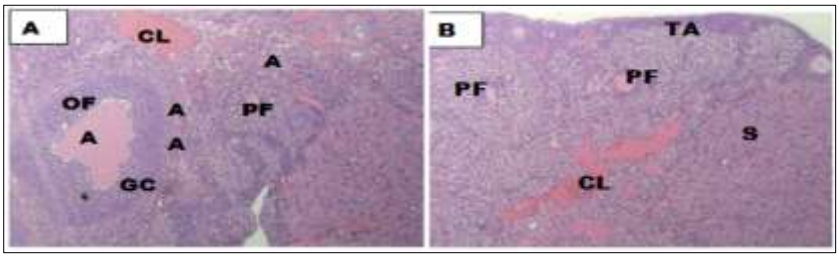
TC = Theca cells; **PF** = Primordial follicles; **GC** = Granulosa cells; **GF** = Graafian follicle; **VC**=Vascular congestion; **BV**=Blood vessels; **CA**=Corpus albicans.

Fig 12: Histologic photomicrographs of ovary of A-untreated female non- pregnant rats; B-untreated female pregnant rats at magnification (X100) stained with H & E technique.



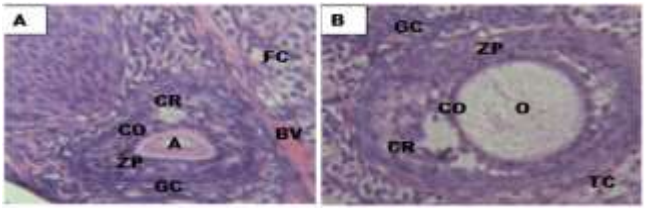
TC = Theca cells; **V**=Vacuolation; **FA** = Follicular antrum; **GCD**= Granulosa cells degeneration; GC = Granulosa cells; CO=Comulus oophorus; FC = Fusiform cells; **CL**= Corpus luteum; **CR**=Corona radiate; **A**=Antrum; **CD**=Cellular degeneration; **O**=Ovum; **ZP**= Zona pellucida

Fig 13: Histologic photomicrographs of ovary of A, C-treated female non- pregnant rats; B, D-untreated female pregnant rats at magnification (X400) stained with H & E technique.



PF = Primordial follicles; **S** = Stroma; **GC** = Granulosa cells; **CL** = Corpus Luteum; **OF**= Ovarian follicles; **A**= Antrum; **TA**= Tunica albuginea

Fig 14: Histologic photomicrographs of ovary of A-treated female non-pregnant rats; B treated female pregnant rats at magnification (X100) stained with H & E technique.



TC = Theca cells; **GC** = Granulosa cells; **GF** = Graafian follicle; **FC** = Fusiform cells; **CL** = Corpus Luteum; **O**=Ovum; **ZP**= Zona pellucid; **CO**=Cumulus Oophorus; **CR**=Corona radiate; **BV**=Blood vessels; **A**= Antrum

Fig 15: Histologic photomicrographs of ovary of A-untreated female non- pregnant rats; B- treated female non-pregnant rats at magnification (X400) stained with H & E technique.

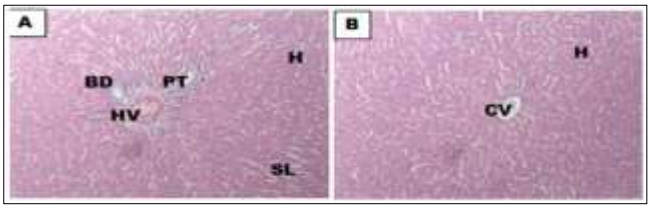
Untreated female ovary

Ovary showing cortical region and germinal center with numerous Graafian, primordial and ovarian follicle containing cumulus oophorus, zona pellucida, oocytes, corona radiate, theca and area of granulose, all within normal cellular architecture.

Treated female Ovary

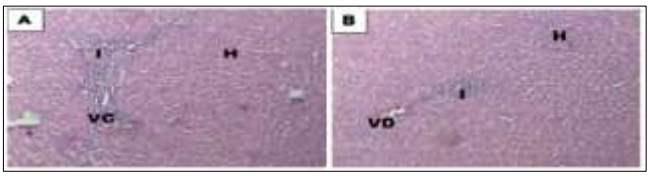
Ovary showing no area of cellular abnormalities with granulosa cell, vascular, follicular cells, stroma containing reticular and fusiform cells, but there is vascular congestion, hyperplasia as compared to the untreated non-pregnant group.

3.5 Histology of the Liver following oral administration of *Icacinia manni* extract in female Wistar rats.



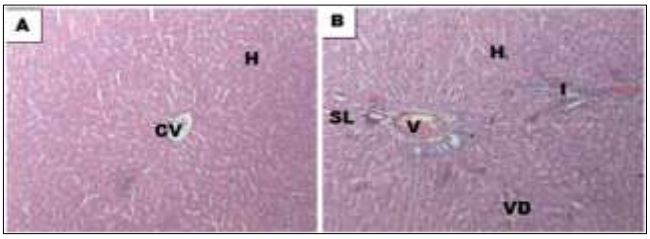
H = Hepatocytes; **CV**=Central vein; **SL** = Sinusoidal layer; **PT** = Portal triad; **BD**=Bile duct

Fig 16: Histologic photomicrographs of liver of A-untreated female non- pregnant rats; B-untreated female pregnant rats at magnification (X100) stained with H & E technique.



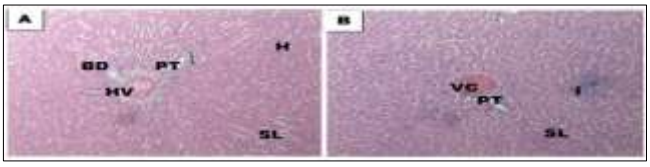
H = Hepatocytes; **I**= Inflammation; **VC** = Vascular congestion; **VD**= vascular degeneration

Fig 17: Histologic photomicrographs of liver of A-treated female non-pregnant rats; B-treated female pregnant rats at magnification (X100) stained with H & E technique.



H = Hepatocytes; **I**= Inflammation; **CV**= Central vein; **VD**= vascular degeneration; **SL**= sinosoidal layer; **V**=Central Vein

Fig 18: Histologic photomicrographs of liver of A-untreated female pregnant rats; B-treated female pregnant rats at magnification (X100) stained with H & E technique.



H = Hepatocytes; **I**= Inflammation; **CV**= Central vein; **VD**= vascular degeneration; **SL**= sinosoidal layer; **BD**=Bile duct; **PT**=Portal triad

Fig 19: Histologic photomicrographs of liver of A-untreated female non-pregnant rats; B-treated female non-pregnant rats at magnification (X100) stained with H & E technique.

Untreated female liver

Liver show area normal cellular pattern of central vein, portal triad, containing red blood cells, billiary epithelium, bile duct, and hepatocytes radiating from the sinusoidal layer all within normal limit.

Treated female liver

Liver show moderate area cellular abnormalities with area of vascular congestion and degeneration, cellular degeneration, vacuolization, inflammation and pyknotic nuclei as compared to untreated female group.

4. Discussion

The body as an entity comprises of many systems which work in synergy with each other to achieve the main purpose, which is survival. Life generally is divided into antenatal and postnatal. In both life stages, survival is of essence thereby making metabolism which aims at energy production a primary resource.

Though, the antenatal life is seen to be more of the female factor driven than the male factor, the fact that there could be some significant male impact should not be totally overruled, having contributed genetically to the makeup.

The highest number of litters per pregnancy, the best weight per litter and the shortest duration of pregnancy were seen in group 1: Females and males received distilled water in this study.

Females receiving extracts had significantly less number of litters per pregnancy as well as lower birth weight. Females receiving extracts also had prolonged duration of pregnancy (group 3 and group 4).

Administration of extract to males did not affect the number of litters or duration of pregnancy. However, there was slight increase in the weight of litters.

Treated female that mated with treated males had the lowest number of litters, lowest weight and longest duration of pregnancy.

Langer [5], reported that fetal growth depends on maternal metabolic factors. Zeng *et al.*, [6] stated that impaired cholesterol homeostasis during pregnancy has a detrimental effect on the development of the embryo in utero and thereby has a negative impact on its adult health. Several studies showed that Serum total cholesterol and triglyceride concentrations increase markedly during pregnancy, though the reported ranges vary among studies [7-10]. In this study, pregnant animals that received the extract had lower levels of Total Cholesterol, Triglycerides, High Density Lipoproteins as well as Low Density Lipoproteins than pregnant animals placed on distilled water (control). Pregnant animals treated with the extracts also had significantly lower Total serum proteins, Serum Albumin and globulin when compared with control group.

Administration of extract also lowered Lipids and Serum Protein levels in non-pregnant animals when compared with control.

The histology of the Liver showed moderate area of cellular abnormalities with area of vascular congestion and degeneration, cellular degeneration, vacuolization, inflammation and pyknotic nuclei and the histology of the ovary revealed vascular congestion and hyperplasia when compared with untreated female group.

Depleting levels of lipids and Serum Proteins obviously affected pregnancy outcome in the experimental animals. It is worthy of note that Cholesterol and Serum Proteins form the building block for new cell formation and enzyme synthesis which has huge influence on cell metabolism and biochemical pathways.

Therefore, we conclude that administration of ethanolic extract of *Icacinia manni* affected pregnancy outcome in rats. This is probably due to the effect of this extract on lipids and serum protein synthesis and metabolism.

5. References

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