THE EFFECT OF FEEDING *Mucuna pruriens* SEED MEAL ON THE SERUM LIPIDS OF ALBINO RATS

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ABSTRACT
The serum lipid levels of rats fed with different percent (10, 20 and 50%) raw and cooked *Mucuna pruriens* seed meal inclusions in the feed were investigated. Powdered raw and cooked *Mucuna pruriens* seed meal were incorporated into the feed of the test rats while normal feed was given to the negative control rats for 28 days. At the end of the test period, blood samples were collected from each rat for analysis. Parameters analyzed were serum total cholesterol, triglycerides, high density lipoprotein, cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C). In the rats fed with cooked *M. pruriens* seeds meal in the feed, the serum total cholesterol, triglycerides and LDL-C were significantly \( p<0.05 - p<0.004 \) reduced when compared to the negative control rats. Also the serum HDL-C was also significantly \( p<0.05 \) increased in the test rats. In the rats fed with powdered raw *M. pruriens* seed meal, there was just marginal decrease in serum total cholesterol and triglycerides which was not statistically significant but the serum LDL-C was significantly \( p<0.05 \) reduced. The HDL-C was also marginally increased. In conclusion, the results of this study show that *M. pruriens* seed meal has a lipid lowering effect on serum lipids which was more pronounced with the cooked seed meal.

KEYWORDS: *Mucuna pruriens*, Total cholesterol, Triglycerides, HDL-C, LDL-C.

INTRODUCTION
*Mucuna pruriens* is an annual twining herb found in tropical areas of Asia, Caribbean and Africa belonging to the family *Fabaceae* with over 100 species (Duke, 1981; Rajeshwar et al., 2005; Omeh, 2010). The leaves are mostly green and trifoliolate, the flowers are white or dark purple and hang on long clusters, pods are sigmoid, the seeds are ovoid and have 4-6 seeds per pod (Duke, 1981; Buckles, 1995). The pods have hairs that cause severe itching when it comes in contact with skin (Buckles, 1995; Leslie, 2005; Omeh and Ezeja, 2010).

*Mucuna pruriens*, known as cow hitchen, cow hage, velvet bean or devil bean is also locally called ‘Agbala’ in Igbo and ‘yerepe’ in Yoruba, both in Nigeria. *M. Pruriens* is reported to have been used for nutritional, pharmacological and industrial purposes. The seeds are good sources of protein and carbohydrates for man and livestock (Emenal and Udedibe, 1998; Pugalesit, et al., 2006). The seeds are also used as soup thickener while the young leaves are used as vegetables by local women (Adebowale and Lawal, 2003).

Cauris (1989) reported that almost all parts of the plant are known to possess high medicinal value. The analgesic activity of the seed has been demonstrated (Sridhar and Rajeev, 2007). It also possesses aphrodisiac, antineoplastic, antimicrobial and anti-epileptic properties (Sathiyannayan and Anilmozhi, 2007). The seeds also have been shown to have analgesic, anti-inflammatory, diuretic, anabolic and hypoglycemic properties (Leslie, 2005; Sridhar and Rajeev, 2007; Thomas, 2006). *M. pruriens* seeds contain L-DOPA which provides a symptomatic relief in Parkinson’s disease treatment (Prakash and Tewari, 1994; Nagashana et al., 2000).

With the above wide utilization of *M. pruriens* seeds for both nutritional and medicinal purposes, there is little or no information on the lipid profile of the seed meal on both humans and livestock. Also coronary artery disease (CAD) is one of the most important cause of death all over the world and hyperlipidemia is one of the risk factors for CAD and data shows that about 20-30% risk of CAD is reduced by treating hyperlipidemia (Gambir et al., 2001).

This study therefore evaluated the serum lipid profile of white albino Wistar rats fed with diets containing raw and cooked *Mucuna pruriens* seed meal in different percent inclusion.
MATERIALS AND METHODS
Collection and identification of plant materials.
The mucuna seeds were collected from Apahe Ezeocha herbal garden at Awokwuru, Olodo in Enugu- Ezike, Igbo-Eze North L.G.A of Enugu state and was identified by Mr A. Ozioko of Bioresources Development and Conservation Programme, (BDCP), Aku Road, Nsukka, Enugu State.

Preparation of the Test Sample
The *Mucuna* seeds were oven dried at the temperature of 40°C for 60 min. After the seeds were dehulled to separate the seed coat from the inner seed. The seed coat was discarded after separation and the seeds divided into two. One part was ground into powdery form while the second part was cooked before grinding into powdery form also with the aid stored in a refrigerator at 15°C until ready for use.

Animals
Mature Wistar albino rats of both sexes obtained from the laboratory animal units of the faculty of Veterinary Medicine, University of Nigeria, Nsukka were used for the experiment. The animals were kept in a well ventilated stainless steel cages at room temperature of about 28°C. Normal growers feed (Vital Feeds®, Nigeria) and clean drinking water was provided to the animals until the time of the experiment. The animals were allowed 2 weeks for acclimatization before the experiment and ethical rules guiding the use of laboratory animals according to Zimmerman (1983) was strictly followed.

Experiments
The experiments were carried out in two folds. The first was done using raw *Mucuna pruriens* seed meal. 20 mature white albino rats of both sexes were randomly divided into 4 groups of 5 rats per group. Group 1 was fed with normal grower feed and served as the negative control group. Group 2 rats were fed with feed containing 10% raw *M. pruriens* powdered seed meal while groups 3 and 4 rats were fed with feed containing 20 and 50% raw powdered *M. pruriens* seed meal respectively. For the second part of the experiment, the above procedure was repeated but with cooked *M. pruriens* seed meal inclusions in the feed at 10, 20 and 50% level. All the rats in the two groups of experiments were fed for 28 days after which the blood was collected for serum analysis.

Blood Collection
Blood samples were collected from the rats through the media canthus using capillary tubes into sterilized sample bottles and centrifuged at 10,000 r.p.m for 10 min to obtain the serum. The serum samples were separated into another set of plain sample bottles and stored in a refrigerator until use.

Biochemical Assays
Total cholesterol was evaluated using the enzymatic colourimetric test Chod-pap method using the in vitro determination of cholesterol in serum or plasma as described by Friedewald *et al* (1972) and Allain *et al* (1974) using assay kits from Quimica Clinica Aplicada S.A., Spain. Also the high density lipoprotein cholesterol (HDL-C) was estimated by the method of Grove (1979) and the serum Triglycerides was evaluated through colourimetric method by Tietz (1990) using assay kits (Quimica Clinica Aplicada, Spain). The low density lipoprotein cholesterol (LDL-C) was estimated using Friedwald’s equation as shown below:

\[
LDL-C = \text{Total cholesterol} - \text{HDL-C} - (0.2 \times \text{TG}) \quad \text{where TG = Value of Triglycerides.}
\]

Statistical Analysis
The results were presented as mean ± SEM and analyzed by Analysis of variance (ANOVA) and the difference between the means were tested using Post-Hoc LSD and values of p<0.05 were considered statistically significant.
RESULTS
The serum lipid levels of rats fed with different percent inclusion of cooked *Macuna pruriens* seed meal in the field is presented in Table 1. The serum total cholesterol and triglycerides were significantly (p < 0.05 - p<0.01) reduced and the reduction was more at the higher percent inclusion level. The serum LDL-C was also significantly (P<0.004) reduced when compared to the negative control group which was more with increase in percentage inclusion. The serum HDL-C was also significantly (p<0.05) increased in groups 3 and 4 rats.

Table 1: Serum lipid levels of rats fed with cooked *Macuna pruriens* seed, meal inclusion in feed.

<table>
<thead>
<tr>
<th>Group</th>
<th>Total cholesterol</th>
<th>HDL-C</th>
<th>LDL-C</th>
<th>Triglycerides</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>93.19±0.24</td>
<td>50.72±0.32</td>
<td>26.28±1.12</td>
<td>80.97±0.39</td>
</tr>
<tr>
<td>2</td>
<td>82.06±0.10*</td>
<td>54.23±0.72</td>
<td>12.60±0.79</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>70.77±0.64**</td>
<td>56.15±0.26*</td>
<td>8.45±1.22***</td>
<td>64.14±1.02**</td>
</tr>
<tr>
<td>4</td>
<td>76.40±1.19**</td>
<td>55.28±0.33*</td>
<td>8.08±0.47***</td>
<td>01±1.39**</td>
</tr>
</tbody>
</table>

* p<0.05  
**p<0.01  
***p<0.004 when compared to the negative control group.

Table 2: Lipid serum profile of rats fed different percent raw *M. pruriens* inclusion in the feed.

<table>
<thead>
<tr>
<th>Group</th>
<th>Total cholesterol</th>
<th>HDL-C</th>
<th>LDL-C</th>
<th>Triglycerides</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>93.19±0.24</td>
<td>50.72±0.32</td>
<td>26.28±1.12</td>
<td>80.97±0.39</td>
</tr>
<tr>
<td>2</td>
<td>92.22±0.10</td>
<td>51.34±0.88</td>
<td>25.01±0.56</td>
<td>79.38±0.33</td>
</tr>
<tr>
<td>3</td>
<td>86.77±0.64</td>
<td>55.44±0.06*</td>
<td>16.09±0.07</td>
<td>79.22±0.67</td>
</tr>
<tr>
<td>4</td>
<td>85.16±1.19</td>
<td>56.11±0.42*</td>
<td>14.95±0.34</td>
<td>71.53±0.98</td>
</tr>
</tbody>
</table>

*P<0.05 when compared to the negative control group.

Table 2 shows the serum lipid levels of rats fed with different percent (10,20and50%) levels of raw *M. pruriens* seeds in the feed. The results show that the total cholesterol and triglycerides were marginally reduced in the test groups though the reduction was not statistically significant. The serum level of LDL-C was significantly (P>0.05) reduced when compared to the negative control group, while there was only a little increase in serum HDL-C in groups 3 and 4 which was also not statistically significant. In the experiment, there was no significant difference between the serum lipid levels of rats fed with 20 and 50% inclusion of *M. pruriens* seed meal in the feed.

DISCUSSION
Lipid profile measures total cholesterol, triglycerides, HDL-C and LDL-C. Hyperlipidemia is well known as one of the major risk factors for atherosclerosis which leads to coronary heart disease (CAD) (Njoku et al.,1999). An increase in the concentration of lipids in the body results in liberation of lysosomes that trigger cell degeneration and research in cardiovascular pharmacology in the past few years has been mainly focused on hypolipidemic (lipid lowering) agents including herbal drugs and diets (Tajudin and Nasiruddin, 2006).

Also, accumulation of cholesterol and triglycerides lead to reduction in insulin mediated metabolic activity and can cause type 2 diabetes resulting in metabolic syndrome (Moller, 2001). From the results of the experiments, cooked *Macuna pruriens* seed meal inclusion in the feed significantly (P <0.05 - P<0.01) reduced the serum total cholesterol and triglycerides of the test rats when compared to the negative control group. Also in those fed with raw *Macuna* seed inclusion in feed these was a marginal decrease, though not statistically significant. These reductions could be beneficial in preventing diabetic complications as well as improving lipid metabolism (Cho et al, 2002). A major component of total cholesterol is low density lipoprotein cholesterol (LDL-C) which is directly related to coronary artery disease (CAD). It is recognized as a major atherogenic lipoprotein and primary target of lipid lowering therapy. Recently more emphasis is given to elevated level of LDL-C as it is an important factor for CAD and lowering its level through diet and medication has been shown to reduce progression of CAD. Also HDL-C has a preventive role in CAD. It has been shown to reduce endothelial incorporation of hydrosphaptidyl choline (lyso-Pe). The level has to be significantly raised by medicament in CAD (Tajudin and Nariuddin, 2006).
In this experiment the serum LDL-C levels of the test rats were significantly reduced in both the rats fed with cooked and raw *Mucuna* seed meal in the fed when compared to control rats, the reduction being more with increase in percentage inclusion. Also the cooked *Mucuna* seed inclusion in the feed increased significantly (P <0.05) the serum HDL-C levels of rats in groups 2 and 4 (Table 1 and 2). This suggests strongly that the inclusion of *M. pruriens* seed meal in the feed may be of value in regulation of lipid profile and consequently be of help in CAD (Omeh et al.,2007). In both experiments, there was no significant difference in total cholesterol, triglycerides HDL-C and LDL-C between the rats that were fed 20% and those that were given 50% *M. pruriens* seed meal in the feed, which suggests that after 20% inclusion level, *M. pruriens* has little or no effects on the lipid profile.

In conclusion, *M. pruriens* has demonstrated a significant lipid lowering activity in the serum of white albino rats in the laboratory which was significant only with cooked *M. pruriens* seed meal and therefore will be of value in coronary heart disease, diabetes and other lipid mediated disorders. More work is however required to test its effect on other biochemical parameters.

REFERENCES


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