

# Glycaemic and Haematological Indices of *Mucuna Pruriens* Seeds on Albino Rats

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**Abstract-** The effect of ethanolic extract from seeds of *Mucuna pruriens* (1000mg/kg and 500mg/kg) on blood glucose in glucose-dosed rats was investigated. The effect of prolonged administration of the extract on haematological parameters was also assayed. The extract and reference drugs were administered orally. Blood glucose concentration was monitored at intervals. Haematological analysis on whole blood revealed a significant ( $p < 0.05$ ) reduction in PCV, RBC, platelets and haemoglobin levels for the group treated with 1000mg/kg extract. ( $20.30 \pm 2.70$ ,  $4.88 \pm 6.76$ ,  $12.30 \pm 59.00$  and  $6.45 \pm 1.05$ ) when compared to the control group ( $29.80 \pm 3.58$ ,  $3.52 \pm 4.65$ ,  $32.60 \pm 14.90$  and  $9.96 \pm 1.31$ ). A significant reduction in blood glucose level of 52.3% and 45.5% in the treatment group were achieved. These suggest that high dose of the extract though effective in glycaemic control could suppress the haemopoietic system on prolong usage.

**Keywords-** *Haematological Indices, Glycaemia, Mucuna Pruriens, Albino Rats*

Seeds of *Mucuna pruriens* have been shown to possess anti-inflammatory, antispasmodic, antipyretic, aphrodisiac and fertility properties. It also has the potential of increasing testosterone levels and proteins in muscles thereby increasing muscle mass and strength. They also possess antioxidant, hypoglycemic, lipid lowering and neuroprotective activities (Misra and Wagner, 2007; Guerranti et al., 2002).

Toxicological investigation to show the safety profile of herbal preparations is necessary before such preparations are adopted as sole or adjunct agents in treatment of ailments. Though it is generally believed that substances of natural origin are safe, various research outcomes have faulted this. Since blood is a good indicator of the health of an organism and also a good pathological mirror of the entire body, haematological parameters are important in establishing the body's functional status as a result of exposure to toxicants. This study therefore investigated the effect of *Mucuna pruriens* seeds on haematological and glycaemic properties of albino rats.

## I. INTRODUCTION

Herbal medicines are popular and have been extensively used in the developing world as alternative to orthodox drugs. Ethnobotanical survey indicates that more than 8000 plants are used as traditional remedies for treatment of high levels of blood sugar. Amongst these include *Telfaira occidentalis*, *Vernonia amygdalina*, *Ocimum gratissimum*, *Boswellia dalzielii*, *Moringa oleifera*, *Azadirachta indica*, *Anarcadium occidentale*, *Magnifera indica* and *Mucuna pruriens* (Arowosegbe, Olanipekun and Kayode, 2015; Etuk and Mohammed, 2009). Fewer side effects, high therapeutic values and low cost are major reasons for seeking alternative methods of treatment of diseases using herbs.

*Mucuna pruriens* is a tropical legume, native to Africa and Asia, extensively used both for its nutritional and medicinal properties (Adepoju and Odubena, 2009). It is known as velvet beans and has common names such as Agbara (Igbo-Nigeria), Yerepe (Yoruba-Nigeria), and Okoti-ekpo (Ibibio-Nigeria). The seed is a natural source of levodopa and are also rich in alkaloids, saponins and sterols. Raw mucuna bean seeds are rich in minerals especially potassium, magnesium, calcium and iron and contains about 27% protein (Olaboro, 1993).

## II. MATERIALS AND METHODS

The seeds of *Mucuna pruriens* obtained from a local market in Ikwuano Local Government Area of Abia State, Nigeria were washed, sun dried and ground into powder using a milling machine. The powdered sample (300g) was macerated in 70% ethanol, filtered and concentrated in vacuo (600C).

For the glycaemic study, albino rats of both sexes divided into four groups of five animals each were fasted overnight but allowed free access to water. The animals were challenged with 2.5g/kg oral glucose. Thirty minutes later, two groups received oral administration of 1000mg/kg and 500mg/kg of the extract respectively, another group was given 5mg/kg glibenclamide while the last group served as control. The blood glucose concentration of the animals was assayed at 0, 30, 60, 120 and 180 minutes using glucose-oxidase-peroxide reactive strips and glucometer.

To study the effect of the extract on haematological parameters, 15 albino rats of both sexes weighing between 80-120g were divided into three groups of five animals each. The first group received 1000mg/kg, the second group was given 500mg/kg extract (oral) while the third group served as control. The extract was administered daily for 28 days. At the end of the period of administration, blood samples, collected via

cardiac puncture, were analysed using an automated haematological analyser (Mindray Auto hematology Analyser BC-5500).

### III. RESULTS

Oral glucose tolerance test (OGTT) is one of the several models for testing antihyperglycaemic agents in which glucose is being administered and blood sugar analysed afterward to determine how quickly it is cleared from the blood. *Mucuna pruriens* seed extract caused a reduction in the blood glucose concentration of glucose dosed rats by 52.3% and 45.5% after 180 minutes. This property makes it potentially useful in human type 2 diabetes subjects with insulin resistance prone to high postprandial glucose surge. Correcting postprandial hyperglycaemia forms part of the strategy for prevention and management of complications in diabetes (American Diabetes Association, 2001) which may include microvascular and macrovascular complications (Cerillo, 2005).

Haematological parameters are useful indices that can be employed to assess the toxic potentials of plant extracts in living systems (Sunmonu and Oloyede, 2010). From the results of this study, animals treated with 1000mg/kg body weight extract had a decrease in platelets count as compared to other groups. Platelets initiate repair of blood vessels and are

considered as acute phase reactant to infection or inflammation (Ganong, 1999). Reduction in platelet count in experimental animals has been reported to indicate adverse effect on the oxygen carrying capacity of the blood as well as thrompoietin (McLellan, McLellan and Walsh, 2003).

The major reasons for assessing red blood count are to check anaemia and evaluate normal erythropoiesis. Haemoglobin levels indicate the amount of intracellular iron while the mean cell haemoglobin (MCH) level is a significant index of folic acid or vitamin B12 need. Animals treated with 1000mg/kg body weight of *Mucuna pruriens* showed significant ( $p<0.05$ ) reduction in RBC, haemoglobin and Packed Cell volume (PCV). The observed decrease in PCV is likely a result of decreased RBC which may be due to possible oxidative injury to the cell membrane. A similar trend was observed by Sule, Elekwa and Ayalogu, (2012) in rats treated with extracts of *Acalypha wilkesiana*. Anaemia, a common pathophysiology associated with diabetes mellitus (Akindele et al., 2012) causes a fall in the iron content of the body (Colak, Asian and Deniz 2012). Adepoju and Odubena, (2009) demonstrated that shade-dried, pulverized seeds of *Mucuna pruriens* at low doses ( $\leq 300$ mg/kg) reduced bleeding time and increased platelet count in rats. This implies that extract of *Mucuna pruriens* seeds at 1000mg/kg body weight may not be safe for diabetics.

TABLE I. EFFECT OF ETHANOLIC EXTRACT OF *MUCUNA PRURIENS* SEED ON BLOOD GLUCOSE CONCENTRATION (BGC) OF GLUCOSE DOSED ALBINO RATS

Treatment /Time (minutes)	BGC $\pm$ SEM (mmol/L)					% Reduction from 30min
	0	30	60	120	180	
Extract (100mg/kg)	3.8 $\pm$ 0.30	10.9 $\pm$ 1.10*	7.3 $\pm$ 0.40*	6.8 $\pm$ 0.60*	5.2 $\pm$ 0.20*	52.3
Extract (500mg/kg)	5.0 $\pm$ 0.40	12.1 $\pm$ 2.54	9.2 $\pm$ 1.13*	8.9 $\pm$ 0.07*	6.6 $\pm$ 0.07*	45.5
Glibenclamide (5mg/kg)	3.7 $\pm$ 0.50	13.3 $\pm$ 0.42	6.6 $\pm$ 0.56*	4.9 $\pm$ 6.90*	3.8 $\pm$ 1.02*	71.4
Control (distilled water)	4.5 $\pm$ 1.30	11.9 $\pm$ 0.65	10.7 $\pm$ 0.07	8.8 $\pm$ 0.06	7.6 $\pm$ 0.07*	36.1

\* $p<0.05$ ; n=5

TABLE II. EFFECT OF REPEATED DOSE ADMINISTRATION OF ETHANOLIC EXTRACT OF *MUCUNA PRURIENS* SEEDS ON HAEMATOLOGICAL PARAMETERS OF ALBINO RATS

Haematological Parameters	Treatment groups (Mean $\pm$ SEM)		
	Extract (1000mg/kg)	Extract (500mg/kg)	Control
WBS ( $\times 10^3/\mu\text{L}$ )	5.90 $\pm$ 3.000	7.90 $\pm$ 2.40	11.10 $\pm$ 1.65
RBC ( $\times 10^6/\mu\text{L}$ )	2.88 $\pm$ 6.76	4.69 $\pm$ 3.23	3.52 $\pm$ 4.65
Haemoglobin (g/dL)	6.45 $\pm$ 1.05	8.86 $\pm$ 0.66	9.96 $\pm$ 1.31
Packed cell volume (%)	20.30 $\pm$ 2.70*	26.73 $\pm$ 2.31*	29.80 $\pm$ 3.58
MCV (fL)	57.55 $\pm$ 0.05	56.90 $\pm$ 2.17	61.33 $\pm$ 1.17
MCH (pg/red cell)	18.20 $\pm$ 0.60	18.86 $\pm$ 0.14	20.46 $\pm$ 0.34
MCHC (g/dL RBC)	31.65 $\pm$ 0.95	33.26 $\pm$ 1.04	33.36 $\pm$ 0.73
Platelets ( $\times 10^3/\mu\text{L}$ )	12.30 $\pm$ 59.00*	50.70 $\pm$ 30.36	32.60 $\pm$ 14.90
Lymphocytes (%)	61.90 $\pm$ 2.90	28.33 $\pm$ 11.58	74.86 $\pm$ 2.16*
Neutrophils (%)	28.50 $\pm$ 1.50	62.56 $\pm$ 9.75	19.80 $\pm$ 2.30*

\* $p<0.05$ ; n=5

#### IV. CONCLUSION

This study has shown that ethanolic extract of *Mucuna pruriens* seed can significantly reduce postprandial hyperglycaemia in type 2 diabetes without the risk of hypoglycaemia that may occur with the use of glibenclamide. However, high dose of the extract could suppress the haemopoietic system.

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