

**SHORT COMMUNICATION****Effect of Aqueous Extract of *Mucuna pruriens* on WBC and ESR of Wistar Rats**<sup>1</sup>C. H. Ogbu, <sup>2</sup>C. E. Achikanu, <sup>1</sup>B. O. Solomon and <sup>1</sup>O. C. Onyia<sup>1</sup>National Biotechnology Development Agency, Abuja, Nigeria;<sup>2</sup>Department of Biochemistry, Enugu State University of Science and Technology, Enugu, Nigeria**ARTICLE INFO**

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**ABSTRACT**

A comparative work on the effect of aqueous extract of *Mucuna pruriens* leaves on the haematological indices of wistar rats were carried out using nineteen juvenile wistar rats. The body weights of the rats ranged from 0.10kg to 0.36kg. 250ml (aqueous extract and normal saline) per kg body weight of the rats was orally administered. 5ml (blood tonic) per kg body weight of the wistar rats was orally administered daily to the rats. The haematological parameters analyzed include the Erythrocyte Sedimentation Rate (ESR), Total White Blood Cell count (TWC) and Differential White Blood Cell count (DWC). The result obtained from the microscopic analysis of the sample suggests that aqueous extract of *Mucuna pruriens* leaves improves the blood.

**\*Corresponding Address:**

C. H. Ogbu  
chyfor1@yahoo.com

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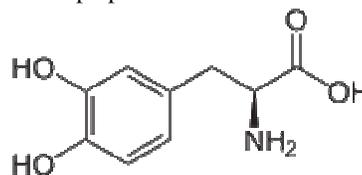
**INTRODUCTION**

Before the era of modern drugs, extracts of large number of plants were known to elicit certain reactions from the human body when applied in the prescribed manner. In recent years, with considerable research, it has been found that many plants do indeed have medicinal values. Among the plants that have been used for medicinal purpose is *Mucuna pruriens*. The leaves of *Mucuna pruriens* are used as remedy for various diseases such as diabetes, arthritis, dysentery and cardiovascular diseases (Nadkarn, 2001).

*Mucuna pruriens* is from the family of fabaceae. *Mucuna* is the genus while *pruriens* is the species. It also has common names such as Velvet bean, Nescafe, Itchy bean, and Cowhage in English, Yerepe in Yoruba and Agbala in Igbo. It is an annual climbing vine that grows 3-18m in height. It is indigenous to tropical regions especially Africa, India and West Indies. Its flowers are white to dark purple in colour. The plant also produces clusters of pods which contain seeds known as *Mucuna* beans. The seed pods are covered with reddish-orange hairs that are readily dislodged and cause intense irritation to the skin. *Mucuna pruriens* is famous for the skin allergy (itchiness) it produces on contact with the seed pods. According to Lesley (2005) the species name "pruriens"

(from Latin, "sensation") refers to the results to be had from contact with the seed pod hairs.

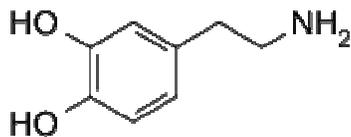
Phytochemicals are bioactive compounds found in plants that work with nutrients and dietary fibre to protect against diseases. The leaves of *Mucuna pruriens* contain Levodopa (L-DOPA) which is a precursor to the catecholamine group (dopamine, epinephrine and norepinephrine). The L-DOPA content increases when the leaves extract are prepared.



L-DOPA (L-3, 4-dihydroxyphenylalanine)

Decarboxylation of L-dopa forms Dopamine. Dopamine is a brain neurotransmitter. It is released by nerve cells to send signals to other nerve cells. Many diseases of the nervous system are associated with dysfunction of the dopamine system. Dopamine cannot cross the protective blood brain barrier, so it does not affect the central nervous system directly whereas L-dopa crosses the protective blood brain barrier. Once L-dopa

has entered the central nervous system, it is converted into dopamine by the enzyme aromatic L-amino decarboxylase (Ian, 2010).



Dopamine [4-(2-aminoethyl) benzene-1, 2-diol]

White blood cells are cells that help to fight infections. They are also called leucocytes. A white blood cell count is a blood test to measure the number of white blood cells. There are five major types of white blood cells; they include basophils, eosinophils, lymphocytes, monocytes and neutrophils (Hoffman, 2005).

Erythrocyte is the red blood cell. Erythrocyte sedimentation rate is a non-specific measure of inflammation that is commonly used as a medical screening test. The test measures the distance that erythrocyte have fallen (Saadeh, 1998).

#### Biological Activity of *Mucuna pruriens* Leaves Extract

In orally administered *Mucuna pruriens* extract, about 33% dose of L-DOPA will be absorbed from the gastro intestinal tract, primarily from the jejunum in the small intestine. Peak plasma concentration will occur three hours with levels that may vary as much as ten-fold among individuals. A majority of the successfully absorbed L-DOPA will be converted to dopamine in the periphery (the body) excluding the brain via the action of the enzyme L-aromatic amino acid decarboxylase (LAAD), less than 1% of the administered dose will enter the brain where it will also be converted to dopamine in the basal ganglia. In addition to dopamine, peripheral L-DOPA will also be metabolized to melanin, norepinephrine, 3-methoxy-tryptamine, methyl dopa, 3,4-dihydroxyphenylacetic acid and excreted in the urine with about 30% of an administered dose being excreted within 24 hours, less than 1% will be unchanged (Kelvin, 2000).

#### Biochemical Effects of *Mucuna pruriens*

##### *Mucuna pruriens* leaves extract improves blood volume

The extract from the green leaves of *Mucuna pruriens* contains proteins and also for the globin part of haemoglobin, the extract also contains vitamin B<sub>12</sub> and folic acid which is essential in DNA synthesis and red blood cell formation. Vitamin C, which is also present in the extract is needed for foliate metabolism and also facilitate the absorption of iron. Iron is a component of the extract, which is required for the blood cell formation and especially for the heme part of haemoglobin (Garey, 1989).

##### *Mucuna pruriens* leaves extract reduce cholesterol

High-density Lipoprotein is found in *Mucuna pruriens* extract. It removes unesterified cholesterol that may have accumulated in cell membrane and plasma where it can be degraded and utilized for the synthesis of the bile acids (Stone, 2000).

#### *Mucuna pruriens* leaves extract kills parasites

It kills parasites by destroying their proteases. Parasites use proteases to digest the host tissue so that the tissue can serve as food for them; the extract destroy the anti-enzyme of the parasites which they use to inhibit the digestive enzyme of the host, since the parasite cannot penetrate the host or use it as food, the parasite will die (Stone, 2000).

#### *Mucuna pruriens* leaves extract inhibits high blood pressure

*Mucuna pruriens* inhibits high blood pressure by inhibiting the mutation of the mineralocorticoid receptor.

#### Clinical significance of WBC count and ESR

The test is performed to find out the number of white blood cells in the body. The body produces more white blood cells when there is an infection or allergic reaction. Normal result ranges from 4,500-10,000 WBC/mcl. A high number of WBC's is called leukocytosis. It may be due to anemia, leukemia, infectious diseases e.t.c. A low number of WBCs is called leukopenia. It may be due to bone marrow failure or radiation (McPherson, 2005).

A decreased erythrocyte sedimentation rate is associated with number of blood diseases in which red blood cells have an irregular settling (Saadeh, 1998).

This present study was designed to know the biochemical effect of aqueous extract of *Mucuna pruriens* leaves on the blood of mammals using wistar rats as case study.

## MATERIALS AND METHODS

### Materials

The apparatus and materials used for this study include Microscope, Cuvette (1cm light path), cover slip, glass slide, number counting chamber, weighing balance, *Mucuna pruriens* leaves, measuring cylinder, capillary tubes, centrifuge, test tubes, syringe, refrigerator, paper, masking tape, labelling marker, hand gloves, ruler, razor blade, test tube rack, ESR tube.

The reagents/Solution used include; Turks solution (Acetic acid Gentian violet), leichman stain, oil immersion, sodium citrate, EDTA, sodium chloride, water, blood tonic, Extract (*Mucuna pruriens*).

### Procedure

Nineteen wistar rats were shared into three groups. The rats were acclimatized with food and water for two days. Their weights were noted and they were labelled. Their weights ranged from 0.10kg to 0.36kg. Fresh leaves of *Mucuna pruriens* were collected from Nsukka in Enugu State, Nigeria. They were identified by C. E. Achikanu of biochemistry Department, Enugu State University of Science and Technology, Enugu, Nigeria. The fresh leaves were weighed, washed, and squeezed to obtain crude extract. Half volume of water was added to the crude extract for dilution. 250ml (aqueous leaves extract) per kg body weight of the wister rats were administered orally on daily basis. 5ml (Blood tonic) per kg body weight and 250ml (Normal saline) per kg body weight were also used as control. After seven days of administration, some of the rats were taken to the

laboratory for collection of blood samples for analysis. The rest of the rats were taken to the laboratory after fourteen days of administration. Blood samples for the blood counts (TWC, DWC, ESR) were collected through the eyes using capillary tubes into a test tube containing EDTA (ethylene diamine tetracetic acid). The standard methods were used to determine the blood counts and ESR.

## RESULTS AND DISCUSSION

Table 1 shows the average result of erythrocyte sedimentation rate after administration. Table 2 shows the average result of the total white blood cell count. Table 3 shows the average result of differential white blood cell count after seven days of administration. Table 4 shows the average result of differential white blood cell count after fourteen days.

**Table 1:** Average result of erythrocyte sedimentation rate after administration

Administration	Average result after 7 days	Average result after 14 days
<i>Mucuna pruriens</i> aqueous extract	1mm/hr	8.5mm/hr
Blood tonic	1mm/hr	4.75mm/hr
Normal saline	2mm/hr	1.5mm/hr

With continuous administration of the extract, increase in ESR was observed after fourteen days of administration. Blood tonic also increased the ESR but not as that of *Mucuna pruriens* extract. The ESR of the normal saline decreased after 14 days.

**Table 2:** Average result of the total white blood cell count

Administration	Average result after 7 days	Average result after 14 days
<i>Mucuna pruriens</i> aqueous extract	7875mm <sup>3</sup>	5000mm <sup>3</sup>
Blood tonic	6250mm <sup>3</sup>	6850mm <sup>3</sup>
Normal saline	4500mm <sup>3</sup>	3300mm <sup>3</sup>

With continuous administration of the blood tonic, the result of the white blood cell total improved. After seven days of administration of *Mucuna pruriens*, there was an increase in total white blood cell count, but with continuous administration, the result decreased to 5000mm<sup>3</sup> which according to McPherson (2005) falls within the normal range.

**Table 3:** Average result of differential white blood cell count after seven days of administration.

Administration	Neutrophil	Lymphocyte	Eosinophil	Monocyte	Basophil
<i>Mucuna pruriens</i> aqueous extract	43%	54.5%	1	0.25	0.5
Blood tonic	53%	48.3%	0.75	0.5	0
Normal saline	32.5%	67.5%	0	0.5	0

**Table 4:** Average result of differential white blood cell count after fourteen days of administration

Administration	Neutrophil	Lymphocyte	Eosinophil	Monocyte	Basophil
<i>Mucuna pruriens</i> aqueous extract	31.8%	67.3%	0.75	0.33	0
Blood tonic	45%	54%	0.5	0.5	0
Normal saline	31%	68%	0.5	0.5	0

Increase in lymphocyte was observed as well as little increase in monocyte was noticed with continuous administration of the aqueous extract of *Mucuna pruriens*. After seven days of administering the aqueous extract to the wistar rats, there was increase in neutrophil as well as increase in basophil, but there was decrease in both after fourteen days of administration.

It can be observed from the result that with administration of the aqueous extract of the green leaves of *Mucuna pruriens*, the result of the analysis on the erythrocyte sedimentation rate (ESR) increased. This suggests that the aqueous extract of *Mucuna pruriens* leaves increases the ESR when administered continuously. It can also be observed that with continuous administration, the blood tonic used had low effect when compared with that of aqueous extract. This confirms the finding of Garey (1989), which had been reported previously.

According to the result, the total white blood cell count increased after seven days of administration with the aqueous extract of *Mucuna pruriens* but not with continuous administration. Also, in the differential white blood cell count, the lymphocyte increased with continuous administration. Increase was observed in the neutrophil after seven days of administration but decreased with continuous administration, this was also observed in the basophil. Eosinophil was increased after seven days of administration but decreased with continuous administration. Weight loss by the animal was observed. This is in accordance with the work done by Maxwell (1987) in which he reported that it was due to the reduction in cholesterol level of the animal by the extract. Garey (1989) and Kenneth (1980) have reported similar results working with *Mucuna pruriens* leaves.

In Conclusion, the present study confirm that aqueous extract of *Mucuna pruriens* leaves improve the blood ESR, TWC and DWC.

### Recommendation

According to the observed results, it can be recommended that administration of *Mucuna pruriens* aqueous extract should be for a prescribed period so as to improve the blood ESR, TWC, and DWC.

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