

Full Length Research Paper

Effect of *Mucuna pruriens* on some haematological and biochemical parameters

G. K. A. Adepoju* and O. O. Odubena

Department of Clinical Pharmacy and Biopharmacy, Faculty of Pharmacy Olabisi Onabanjo University,
Sagamu, Ogun State, Nigeria.

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Mucuna pruriens (MP) has been pharmacologically studied for various activities like aphrodisiac, anti-diabetic, anti-microbial and anti-epileptics activities. The present study aims at investigating the effects of shade-dried seeds of *M. pruriens* on some haematological and bio-chemical parameters. Wistar strain albino rats of both sexes with weights ranging from 220 to 300 g were fed with shade-dried pul-verized seeds of *M. pruriens* in a 10-days experiment. The result shows that the Nigerian *M. pruriens* seeds improve the haematological and serum biochemical parameters determined in a dose-dependent manner. The study shows that shade-dried, pulverized seeds of *M. pruriens* lowers blood cholesterol, blood urea and serum creatinine. It also reduces bleeding time; increases platelet count and these were statistically significant ($p < 0.05$). However, the effect on packed cell volume (PCV) was not statistically significant when compared with the control ($p < 0.05$). Hence, shade-dried seeds of MP seeds are not poisonous when compared with the raw seeds.

Key words: *Mucuna pruriens*, arteriosclerosis, uremia, haemostatic ability, platelet count, creatinine, hyperchol-esterolaemia, hematological parameters.

INTRODUCTION

Mucuna pruriens (MP) is a twinning herb found in the tropics and well known for producing itching (Rajeshwar et al., 2005). This property is attributed to the presence of 5-hydroxytryptamine (5-HT) in the hair on the pods (Amstrong et al., 1953). MP seeds are herbaceous forage and food legumes that have for a long time found wide-spread usage as rotation crops for management of va-rious pests and weeds control (Buckles, 1995; Duke, 1981). It is little known and used for human food and ani-mal feed in Nigeria (Emenalon et al., 2004). The seeds have been reported to be anti-diabetic (Dhawan et al., 1980). Use of the bean in livestock feeding is one of the best ways of exploiting its agronomic and nutritional po-tentials as the bean contains relatively high protein and energy contents (Emenalom and Udedibie, 1998; Udedibie and Carlini, 1998; Pugalenthil et al., 2006). The beans are known to produce the unusual non-protein amino acid, L-dopa, a potent neurotransmitter precursor that is believed, in part, to be responsible for the toxicity of the *Mucuna* seeds (Lorenzetti et al., 1998). This agent

is used in the treatment of Parkinson's disease (Bell and Janzen, 1971; Daxembichler et al., 1971; Hussain et al., 1997). The anti- epileptic and anti-neoplastic activity of methanol extract of *M. pruriens* has been reported (Gupta et al., 1997). Rajeshwar et al. (2005a) have revealed that the methanol extract of MP seeds showed significant *in – vitro* anti-oxidant activity while it has also been indicated that the methanol extract of *M. pruriens* can be a po-tential source of natural anti-oxidant and anti-microbial agent (Rajeshwar et al., 2005b). It restores antioxidant levels and reduces lipid peroxide content (Shukla et al., 2007).

All parts of *M. pruriens* possess valuable medicinal properties (Caius, 1989) and it has been studied for various activities like anti-diabetic (Akhtar et al., 1990); aphrodisiac, anti-neoplastic, anti- epileptic, antimicrobial activities (Sathiyarayanan et al., 2007). Infact, its learning and memory enhancement has been detailed by Poornachandra et al. (2005) just as its aphrodisiac and antivenom activities have been detailed respectively by Rajendran et al. (1997), Shukla et al. (2007), Guerranti et al. (2002) and Fattepur et al. (2008). Its antihelmintic acti-vity has been demonstrated by Jalalpure (2007).

M. pruriens has also been shown to be neuro-

*Corresponding author. E-mail: monarch012002@yahoo.com.
Tel: 0803-474-0000.

protective (Dhanasekaran et al., 2004). Its analgesic and anti-inflammatory activities had been reported by Hishika et al. (1981). Its use as a fertility agent (in men) was documented by Buckles et al. (1995).

Esonu et al. (2001) have reported that raw *Mucuna* bean meal had deleterious effects on the performance and blood constituents of weaner pigs. However, the effects of feeding cracked soaked and cooked Nigerian *Mucuna* seeds on the hematological and serum biochemical parameters of pigs have not been fully understood. The effects of raw, cracked, soaked and cooked Nigerian *Mucuna* seeds on pathophysiological parameters such as weight gain, internal organ characteristics, hematological and serum biochemistry of large white land race pigs raised in a humid tropical environment had been determined by Emenalom et al. (2004). However, it has been shown that heating improved the nutritive quality of *M. pruriens* (Iyayi et al., 2004; Emenalom et al., 2004; Ravindran et al., 1998).

The blood contains a myriad of metabolites and other constituents that provide a valuable medium for clinical investigation and nutritional status of individuals. Hence, WHO (1963) recommended the use of blood, biochemical and hematological parameters in medical assessment. Other authors have also shown that incorporating the seeds of MS into dietary components have measurable effects on blood components (Emenalom et al., 2004). The importance of blood chemistry profiles in relation to nutrient intake has been reported (Church et al., 1984).

It is therefore, the aim of this study to investigate the effect of shade-dried seeds of *M. pruriens* on some hematological and biochemical parameters of the Wistar strain albino rats as opposed to the raw and pre-heated seeds that have been carried out by other authors. Hence, the study is adequate and justified.

MATERIALS AND METHODS

Chemicals

Analytical grade chemicals include: Diphenyl- carbazone, mercuric nitrate, $Mg(NO_3)_2$, sodium chloride (NaCl), sulphuric acid, sulphuric acid, hydrochloric acid (HCl), phenol red, diacetylmonoxime, trichloroacetic acid (TCA), picric acid, carbon tetrachloride (CCl_4) and normal saline.

Plant material

M. pruriens (MP) seeds were obtained and validated at the Forestry Research Institute of Nigeria (FRIN). A voucher specimen with herbarium number FH107680 was obtained. The seeds were washed with water, shade-dried and the seeds were pulverized with a mechanical grinder. The powdered drug was administered to the rats based on kg/ body weight.

Animal and experimental design

Wistar strain albino rats of both sexes weighing 220 - 300 g were obtained from the Department of Clinical Pharmacy and Biopharmacy, Faculty of Pharmacy, Olabisi Onabanjo University (OOU),

Sagamu, Ogun State, Nigeria. The rats had no history of drug consumption, that is, they had not been used for any investigation. The rats were put on standard rat pellet (feed) and pure drinking water and allowed to get acclimatized for 21 days before the start of the experiment.

The rats were randomly assigned into five groups of 5 rats per group. Group A served as the control group and the rats in the group were given normal saline (1 ml/kg/body weight). The group B rats were given 50 mg/kg body weight of MP for ten (10) days. Group C consists of rats that were administered 100 mg/kg body weight. Groups D and E were administered with 200 mg and 300 mg/kg body weight respectively. All the doses were administered once daily for ten (10) days for all the groups.

Sample preparation for biochemical evaluation

The rats were sacrificed and blood was collected from the rats by cardiac puncture. Renal function was evaluated by quantifying the levels of urea serum chloride, bicarbonate, cholesterol and creatinine. The levels were determined by using standard laboratory methods. Haematological parameters were assayed by Ivy's Method (Bleeding Time); while the chloride level was determined by the method of Schales and Schales (1941) while serum bicarbonate analysis was carried out using the method of Segal (1955).

Statistical analysis

Data values were expressed as Mean \pm SEM (standard error of the mean) and statistical significance of the treatment effect was analyzed using the student's t-test statistics by comparing the control with the MP-treated groups. Probability limit was set at $p < 0.05$.

RESULTS AND DISCUSSION

Assessment of haemodynamic and biochemical effects

The results from the Table 1 show the effect of *M. pruriens* (MP) on identified hematological parameters. Bleeding time was significantly reduced when compared to the control ($p < 0.05$). This was dose-dependent. MP also increased platelet count dose-dependently and this was significant for Groups C, D and E. The effect on packed cell volume (PCV) was not statistically significant when compared to the control.

The table 1 also shows the effect of MP on the biochemical parameters. The serum cholesterol level was significantly lowered by the administration of MP when compared to the control and this was found to be dose-dependent.

Generally, administration of MP at 50 mg/kg body weight showed a statistical significance in only two (2) parameters (that is, bleeding time and plasma cholesterol levels). It showed no significant effect in the other six (6) parameters. It has no statistically significant effect on the bicarbonate (HCO_3) level while it significantly increased the chloride (Cl) level at 100,200 and 300 mg/kg body weight ($p < 0.05$).

Table 1. Showing the effect of *Mucuna pruriens* on some hematological and biochemical parameters.

Group	Drugs	Bleeding time \pm SEM	PCV \pm SEM	Platelet count \pm SEM	Bicarbonate \pm SEM	Chloride \pm SEM	Cholesterol \pm SEM	Urea \pm SEM	Creatinine \pm SEM
A	Control	49.8 \pm 2.85	28.4 \pm 4.0	163,000 \pm 21,847.6	21.8 \pm 0.9	90.0 \pm 0.5	70.0 \pm 5.5	39.2 \pm 3.2	0.70 \pm 0.09
B	50 mg/kg	44.2 \pm 1.32	27.8 \pm 2.93	172,200 \pm 26,726.9	22.8 \pm 1.8	90.2 \pm 0.7	56.0 \pm 8.4	36.2 \pm 3.1	0.66 \pm 0.07
C	100 mg/kg	43.4 \pm 2.2	33.8 \pm 0.58	354,000 \pm 20,360.3	24.6 \pm 2.2	93.2 \pm 2.2	54.4 \pm 6.7	34.2 \pm 1.8	0.58 \pm 0.04
D	200 mg/kg	42.0 \pm 0.83	27.8 \pm 2.45	360,400 \pm 22,379.4	20.6 \pm 0.36	96.0 \pm 1.3	48.4 \pm 2.5	33.0 \pm 2.2	0.58 \pm -0.04
E	300 mg/kg	41.3 \pm 0.75	33.3 \pm 1.9	447,000 \pm 52,621.3	21.75 \pm 0.85	98.2 \pm 2.4	29.75 \pm 3.4	28.3 \pm 5.4	0.52 \pm 0.1

(P < 0.05) (All doses per kg body weight).

Assessment of renal function

The kidney is a major organ of excretion and its functional status is estimated by the creatinine clearance, CL_{Cr} , which, inadvertently, is a measure of the glomerular filtration rate, GFR. Creatinine is formed by the metabolism of phosphocreatinine, a high energy molecule which provides a rapid supply of ATP for the cellular functions. Phosphocreatinine is converted spontaneously to creatinine on a regular basis. It is released into the blood and excreted by the kidney as a metabolic waste. In experimental studies, creatinine measurement is used almost exclusively in the assessment of kidney function.

The aim of the study is to investigate the effect of MP on some biochemical and haematological parameters. *M. pruriens* significantly reduced the cholesterol level dose-dependent (p < 0.05). It could, therefore, be used in reducing high plasma cholesterol levels (hypercholesterolaemia). The urea and creatinine levels were reduced by the administration of MP when compared to the control. Both were statistically significant (p < 0.05). The reduction in the creatinine was dose-dependent. The reduction in urea and creatinine levels thus makes the MP a potential drug to improve kidney functions.

The haemostatic ability of MP is evidenced in its ability to significantly reduce bleeding time with in-

crease in dose. This is confirmed by the increase in platelet count dose-dependently, that is, the mean platelet count showed an increase with increase in the dose of the drug. The increase, when compared to the control, is statistically significant (p < 0.05) except for group B (50 mg/kg body weight). Thus, MP has haemostatic effect (increase in platelet count that is critical to the formation of haemostatic plugs which function to enhance clotting and prevent blood loss). The ability of MP to increase the packed cell volume (PCV) is observed to be statistically significant at 100 and 300 mg/kg body weight (groups C and E) when compared to the control (p < 0.05).

In the electrolyte category, the chloride level has significantly increased except for group B (50 mg/kg body weight) when compared to the control. MP has no statistically significant effect on the bicarbonate parameter at all the doses applied.

From the Table 1, it is observed that at 50 mg/kg body wt, MP is only statistically significant on only two (2) parameters (bleeding time and plasma cholesterol; when compared to the control. Hence, for it to be statistically significant on the other parameters assessed, the dose should be higher than 50 mg/kg body weight.

Conclusion

Thus, MP has a good potential for clinical applica-

tions but a dose-response study is, therefore, necessary to determine the dosage individualization for each of the clinical applications. It is noteworthy that MP did not produce any noticeable toxicity in the rats at the doses applied.

It could be pertinent to point out the nutritional value of the MP in lowering blood cholesterol, blood urea and serum creatinine and, therefore, reduce the incidence of arteriosclerosis uremia and in the assessment of nephritic functions.

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