integrity Research Journals

Journal of Animal Science and Veterinary Medicine
Volume 8(4), pages 109-116, August 2023
Article Number: 79124B324
ISSN: 2536-7099
https://doi.org/10.31248/JASVM2023.386
https://integrityresjournals.org/journal/JASVM

Full Length Research

The comparative effect of aqueous extracts of *Mucuna pruriens and Telfairia occidentialis* leaf on liver enzymes and serum protein of albino rats

Ada A. Akwari* and Archibong Nsa Archibong

Department of Animal and Environmental Biology, Faculty of Biological Sciences, Cross River University of Technology, Calabar, Nigeria.

*Corresponding author. Email: perfectgrace74@gmail.com; Tel: +234(0)8062839987, +234(0)7017045018.

Received 9th June 2023; Accepted 20th July 2023

ABSTRACT: An experiment was conducted to determine the comparative effect of aqueous leaf extract of *Mucuna prurines and Telfairia occidentalis* on liver enzymes and serum protein in albino rats. Complete randomised design was used to assign twenty (20) Albino rats into four (4) groups of five rats per cage. Group 1 (control) received rat feed and water only, Group 2 received 25 mg/kgbw of *M. pruriens,* Group 3 received 25 mg/kgbw of *T. occidentalis* while group 4 received 50 mg/kgbw dose equipotent concentration of *T. occidentalis* and *M. pruriens*. After 21 days, liver enzyme and serum protein were estimated. The result showed a significant ($p<0.05$) decrease in aspartate aminotransferase (AST) of all the experimental animals across the groups especially *T. occidentalis* (44.20±3.47 µ/L) treated group when compared with control (88.80±3.87 µ/L). Also, alanine aminotransferase (ALT) of *M. pruriens* (36.20± 0.98* µ/L) treated group was significantly increase whereas *T. occidentalis* (16.86 ± 2.69* µ/L) treated group was significantly decreased. The elevated ALT in *M. pruriens* treated group showed extract may cause liver damage since elevated ALP is a more specific indicator of liver damage. Alkaline phosphatase (ALP) was significantly deceased in all experimental animals across the groups when compared with the control. Serum protein result showed significant decrease in albumin level of all the experimental groups, however, globulin level was slightly increased in all the experimental groups. There was no significant difference in total protein of all the experimental groups. In conclusion, extract of *T. occidentalis* showed high hepatoprotective effect while extract of *M. pruriens* was hepatotoxic. The two extracts were generally low in protein. It is recommended that leaf extracts should be used singly, combination therapy should be avoided to reduce hepatotoxic effect of *M. pruriens*. *T. occidentalis* is hepatoprotective and highly recommended for use in control of anaemia.

Keywords: Alanine aminotransferase, alkaline phosphatase, aspartate aminotransferase, hematopoietic, hepatoprotective, hepatotoxic.

INTRODUCTION

The utilization of plant extracts in folk medicinal practices for treatment of various ailment has been ongoing since the ancient times. The World Health Organization (WHO) defines a medicinal plant as a plant which one or more parts of it contains substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs (Ogamba *et al.*, 2010).

Mucuna pruriens (Plate 1) is t hought to have originated from India, it is one of the popular medicinal plants of India and it constitutes more than 200 indigenous drugs formulations. All parts of *Mucuna pruriens* possess valuable medicinal properties (Mengue *et al,* 2001). In the eastern part of Nigeria, *M. pruriens* popularly known as “agbala” leaf in Igbo populace is used as a blood tonic traditionally (Akindele and Busavo, 2011; Katzenschlager *et al.,* 2004; Ogamba *et al.,* 2010). Among the natives of

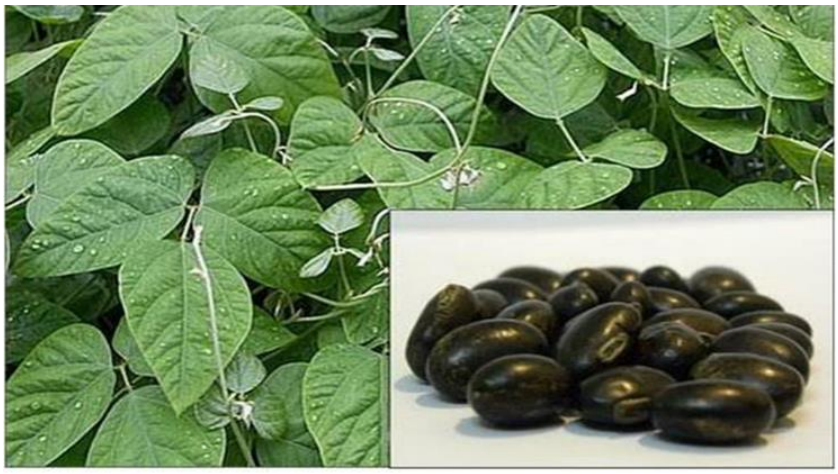

Plate 1. *Mucuna pruriens* leaf and seed.

Plate 2. *Telfairia occidentalis*.

eastern part, the use of *M. pruriens* (“agbala” leaves) extract is a very common remedy for the treatment of anaemia (Akindele and Busayo, 2011).

Telfairia occidentalis (Plate 2) is a tropical vine in West Africa with leafy vegetable and edible seeds. The common names for the plant include fluted gourd and fluted pumpkin (Fagbemi *et al*., 2005). It is commonly consumed in many countries and its medicinal importance is gradually attracting the attention of researcher. It has been established that the plant is useful in the treatment or management of ailments such as anaemia and diabetes (Akindele *et al*., 2011; Ajayi *et al*., 2000; Eseyin, 2005; Nwozo *et al.,* 2004).

Telfairia occidentalis is a member of “Cucurbitaceae” family, in Eastern Nigeria it is commonly known as fluted pumpkin or “ugu” or “ikong ubong” in south Eastern Nigeria. The shoots contain high levels of potassium and iron while the seeds are made up of 27% crude protein and 53% fat (Fagbemi *et al*., 2005).

Aqueous extract of *Telfairia occidentalis* leaves increased hematological and reproductive indices in male rats (Fasuyi, 2006). The chemical composition has been shown to include protein, fat, minerals, vitamin A, thiamins, riboflavin, nicotinamide and vitamin C. *T. occidentalis* has been shown to be very rich in essential and non-essential amino acid; alanine, aspartate, glycine, glutamine, histidine, lysine, methionine, tryptophan, cystine, luicine, arginine, serine, threonine, phenyl-alanine, valine, tyrosine and isoleucine (Fasuyi, 2006, Tindal, 1998). Fluted pumpkin leaves has high levels of protein and iron and as a result of haematinic properties liquid extracts from the leaves has been used in the treatment of anaemia. The poor economic state of the developing countries has kept animal protein foods out of the reach of more than 65-70% of the masses, fluted pumpkin leaves and plant therefore possess a ready substitute for our scare animal protein (Nworgu, 2004).

The liver is the largest and most complex internal organ

in the body. It performs important roles in the maintenance of internal environment and homeostasis through its' multiple and diverse functions. Such functions include secretion, metabolism, storage and other functions. It is often being said that to "live depends upon the liver" which means that impairment of the liver affects the whole body adversely and could lead to death. Liver has great capacity to detoxicate toxic substance and synthesizes useful principle (SI-Tayeb *et al.*, 2010; Saxena *et al.*, 1999). Hepatitis or inflammatory disorder involves inflammation and changes to the hepatocytes and is one of the most prevalent diseases of the liver. About 18,000 people had been reported to die due to liver cirrhosis caused by viral hepatitis yearly (Wang *et al*., 2008). Damage to liver inflicted by hepatotoxic agents is of grave consequence. Many medicinal /indigenous plants have been shown to have hepato-protective agents; however, some are hepato toxic and can be only identified through quality research (Prashant *et al*., 2001). Most herbal medicines are taken in large doses and care givers concentrate on the positive effects of the herbs neglecting its hazardous effect. However, observation has shown that some of the sick persons recover from the ailment of focus but sooner than expected come up with problems of vital organ dysfunction or breakdown.

M. pruriens and T. occidentalis are important medical plants, however limited studies are available on effect of their extracts on liver function of albino rats. A clinical study confirmed the efficacy of the seeds of *Mucuna pruriens* in the management of Parkinson's disease by virtue of their L-Dopa content. The organs mostly affected by toxins from medicinal plants include the liver, heart and kidney (Adepoju *et al,* 2009; Muhammad *et al*., 2015). In orthodox medicine, the integrity of the liver is ascertained through laboratory test before administration of drugs. This gap has not been closed in traditional medicine. The vital organs like liver can be evaluated by determining the activities of some enzymes specific to these organs in serum. AST, ALP and ALT presence in serum are used to assess the integrity of the liver and its functionality. Increased level of these enzymes in the serum is an indication of damage or health status of these organs. Thus, this study was carried out primarily to investigate the effect of two leaf extract *M. pruriens* and *T occidentalis* on the liver enzymes and serum proteins of Albino rats.

Objectives

Specifically, this study was carried out to investigate:

1.
2. The effect of leaf extract of two vegetables *M. pruriens* and *T occidentalis* on the liver enzymes of Albino rats.
3. The effect of leaf extract of two vegetables *M. pruriens* and *T occidentalis* on the serum proteins of Albino rats

MATERIALS AND METHODS

This study was carried out at the animal house of Faculty of Biological Sciences, Cross River University of Technology, Calabar, Cross River State, Nigeria. The albino rats were kept in clean cages (aluminium bottom and wired top) at the animal house of Department of Animal and Environmental Biology where they were given food (normal standard rat pellets) and water under standard condition and temperature of 25 to 29°C.

Data collection and identification of plant sample

Fresh *Mucuna prurien* leaves (Devil Bean Leaves) were collected from Obubra Local Government, Cross River State where they grow in abundance while the fresh *Telfairia occidentalis* (Fluted Pumpkin) were purchased at Ekpo-Abasi Market Calabar South Local Government Area of Cross River State. Both leaves were taken to the Botany Department for identification and authentication.

Fresh *Mucuna pruriens* leaves and *T. occidentalis* leaves were washed and dried for some days under standard room temperature. They were further subjected to oven at low temperature for 14 hours and were blended to fine powder using electric blender according to Majekodunmi *et al*. (2011) and Rathi *et al*. (2011).

Two hundred and fifty grams (250 g) of the blended leaves were weighed out using an electronic weighing balance and were poured through a filter paper –No 1. The *Mucuna pruriens* were soaked with 100 mls distilled water for 72 hours. The extraction of *T. occidentalis* followed the same procedure. After filtration, the filtrate was allowed to evaporate to dryness at 70°C in an oven. The extracts were reconstituted in distilled water and weighed out (25 grams of the dried extract was dissolved in 100 ml of distilled water) to obtain the desired concentration.

Administration

During the administration process, all the rats were administered with 25 mg/kgbw (each) of *Mucuna pruriens* or *T. occidentalis* in all the groups. Test dose was according to Ogunmoyole *et al.* (2021), Majekodunmi *et al.* (2011) and Rathi *et al*. (2011). The protocols required in the use of laboratory animals as laid out by the Cross-River University of Technology, Calabar Committee on Ethics for Scientific Research and also existing internationally accepted protocols for laboratory animal use and care as contained in the CCAC (1992) were duly observed.

Experimental design

Completely randomized design was used to assign the animals (both male and female) into four groups of five (5) rats per cage (group) as shown below:

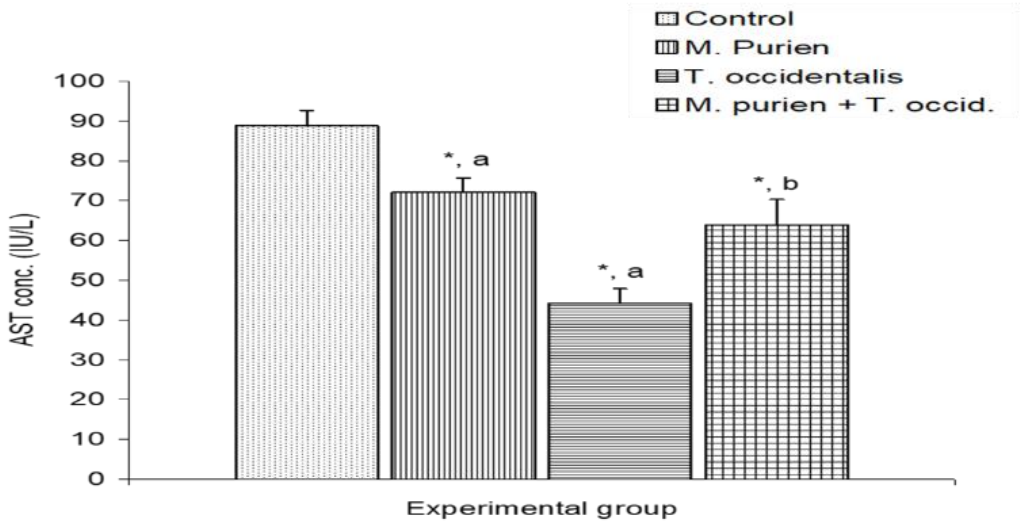

Figure 1. Comparison of aspartate aminotransferase concentration in the different experimental groups. Values are expressed as Mean + SME, n = 5, * = significantly different from control at $p<0.05$, [a] = significantly different from *M. purien* at $p<0.05$, [b] = significantly different from *T. accidentalis* at $p<0.05$.

Group 1 (Control) - received normal rat feed + drinking water *ad libitum* daily for 21 days.
Group 2 received same as group 1 plus aqueous extract of *M. pruriens* (25 mg/kgbw once daily).
Group 3 received same as group 1 plus aqueous extract *T. occidentalis* (25 mg/kgbw once daily).
Group 4 received same as group 1 plus aqueous extract *T. occidentalis* and *M. pruriens* (50 mg/kgbw once daily).

The administration was done orally using metal oropharyngeal cannula and the experiment lasted for 21 days. The animals were allowed to acclimatize with their environment for one week before the commencement of the extract administration.

Collection of blood samples and animal sacrifice

All the rats were sacrificed after 21 days of treatment with the extract of *Mucuna pruriens* and *T. occidentalis*. The rats were fasted overnight but still had access to water *ad libitum*. Blood samples were collected by cardiac puncture under ether anesthesia. The blood was collected in sample bottles containing EDTA for haematological analyses. The analysis was carried out with authomated haematologic analyzer SYSMEX KX21 a product of SYSMEX corporation Japan employing the method described by Dacie and Lewis (2002).

Statistical analysis

Data were analyzed using Statistical Package for Social Science (SPSS) version 16 and presented as Mean SEM. The student T- test was employed to compare two sets of data. Three or more variables were compared with one-way analysis of variance (ANOVA). $P<0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

The results showed a significant decrease in Aspartate transaminase (AST) of animals treated with *Telfairia occidentalis* (44.20 ± 3.47µ/L). Also, there was a significant decrease on AST of animals treated with a combination of the two extracts (63.80 ± 6.52µ/L) when compared with the control (88.80 ± 3.87µ /L) as shown in Figure 1 and Table 1. Elevated level of AST and ALT are indicators of liver damage even though AST can be found in other organ such as heart and skeletal muscle. Meanwhile, decreased level as recorded in *T. occidentalis* shows that the leaf extract may not have caused liver damage.

The result in Figure 2 showed there was a significant increase in Alanine transaminase (ALT) of animals treated with *M. pruriens* (36.20 ± 0.98* µ/L) whereas there was a decrease in ALT of animals treated with *T. occidentalis*. (16.86 ± 2.69*µ/L). Decrease in ALT caused by *T. occidentalis* is a good indication that the leaf extract did not cause liver damage, since ALT elevation is a more specific indicator of liver damage (Giboney, 2005). The elevated level of ALT in *M. pruriens* treated animals shows that *M. pruriens* may cause liver damage; elevated levels of ALT was also seen in the combination treatment with *M. pruriens* and *T. occidentalis* (24.00 ± 2.26 µ/L). Studies

Table 1. Comparison of liver enzymes and serum protein of Wister Albino rat in different experimental groups.

Different experimental groups	AST (μ/L)	ALT (μ/L)	ALP (μ/L)	ALB (g/dL)	GLO (g/dL)	TP (g/dL)
Control	88.80± 3.87	22.60± 2.01	49.20± 0.25	4.56±0.28	1.16±0.24	5.56±0.20
Mucuna pruriens	72.20± 3.47*	36.20± 0.98*	40.40± 1.50*	3.74± 0.19*	2.20± 0.29*	6.01± 0.23
Telfairia occidentalis	44.20± 3.72*	16.86± 2.69	46.80± 1.50*	3.86± 0.19*	2.02± 0.09*	5.86± 0.15
M. pruriens + T. occidemtalis	63.80± 6.52*	24.01± 2.26	41.60±1.29*	3.30± 0.08	2.48± 0.21*	6.01 ±0.27

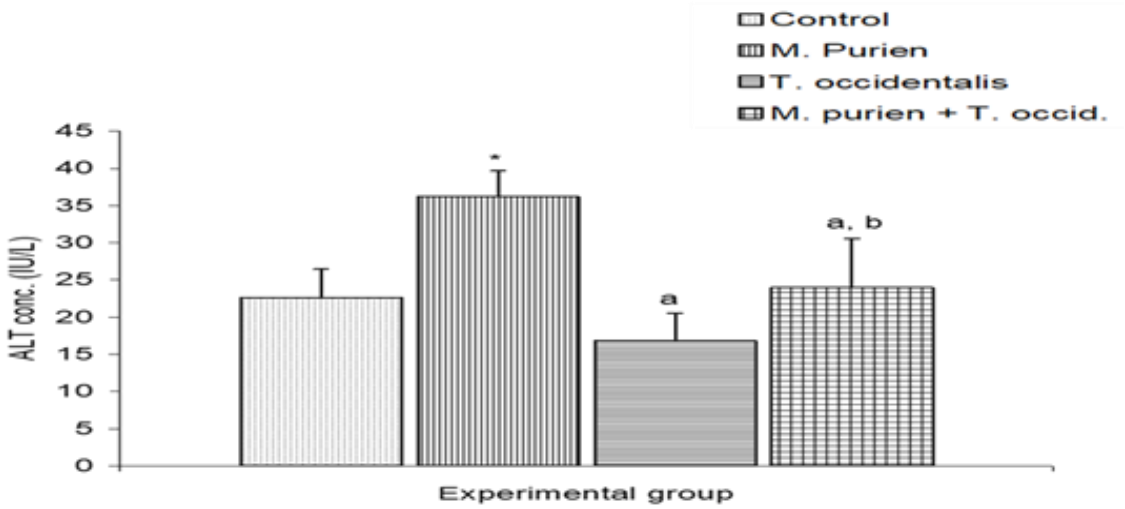

Figure 2. Comparison of alanine aminotransferase concentration in the different experimental groups. Values are expressed as Mean + SME, n = 5, * = significantly different from control at p<0.05, [a] = significantly different from *M. purien* at p<0.05, [b] = significantly different from *T. accidentalis* at p<0.05.

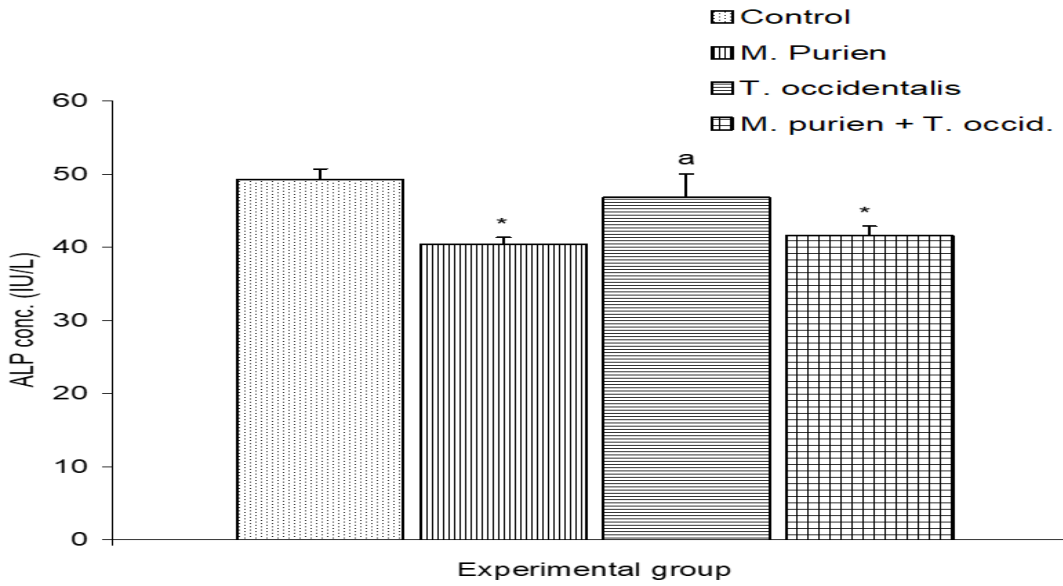

Figure 3. Comparison of alkaline phosphatase concentration in the different experimental groups. Values are expressed as Mean + SME, n = 5, * = significantly different from control at p<0.05, [a] = significantly different from *M. purien* at p<0.05.

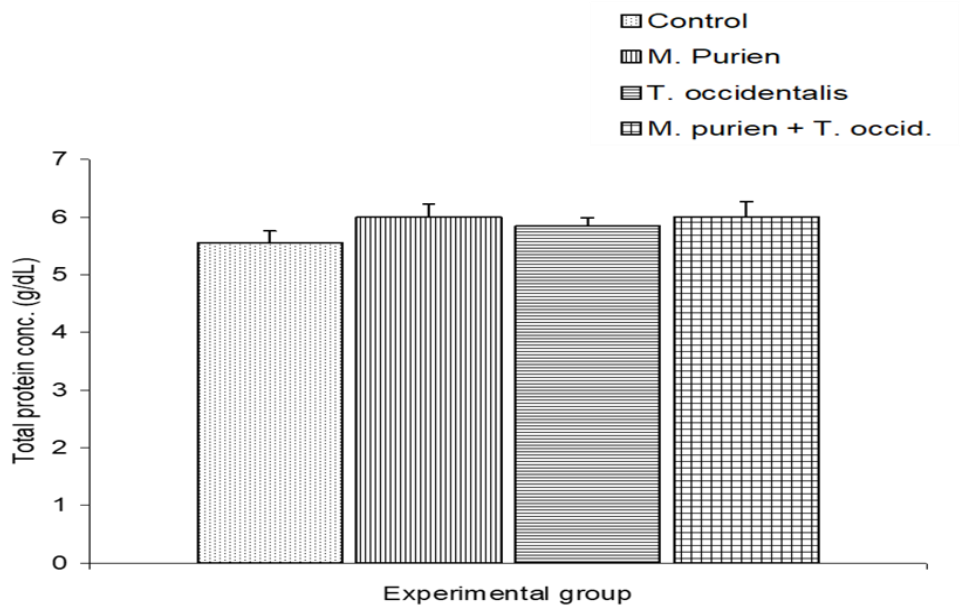

Figure 4. Comparison of total protein concentration in the different experimental groups. Values are expressed as Mean + SME, n = 5. No significant differences among groups.

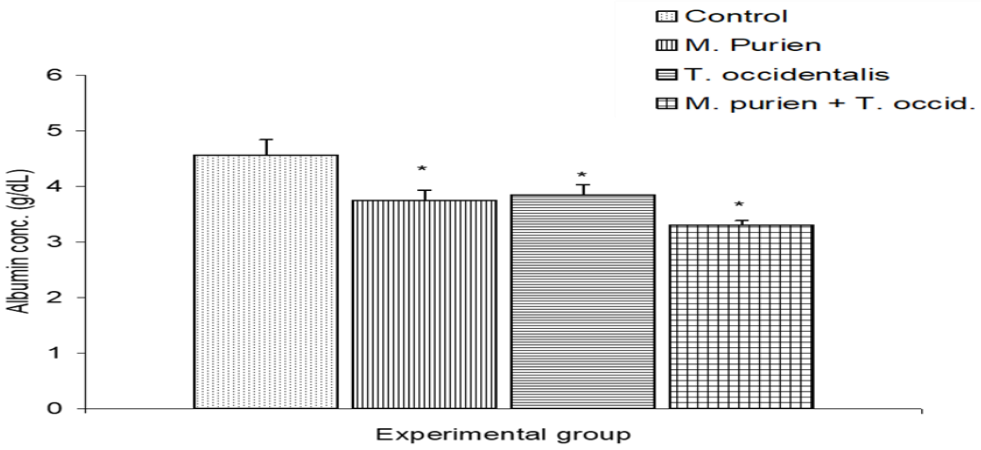

Figure 5. Comparison of albumin concentration in the different experimental groups. Values are expressed as Mean + SME, n = 5. *significantly different from control at p<0.05.

conducted by Anna *et al.* (2012) showed hepatotoxicity associated with herbal treatment both acute and chronic. Moreso, in traditional herbal treatment people are more interested in positive claim of what herbs can cure than they are in toxicity studies and dosage.

Figure 3 showed significant decrease in alkaline phosphatase (ALP) of animals treated with *Mucuna pruriuens* (40.40±1.50* µ/L) and *Telfairia occidentalis,* (46.80 ± 1.50* µ/L), as well as in animals treated with a combination of the two leaf extracts (41.60 ± 1.29* µ/L) when compared with the control (49.20 ± 0.25µ/L) in Table 1.

Serum protein result showed no significant difference in total protein of Albino rats treated with *M. prurien* or *T. occidentalis*. Also, the group that received combined treatment showed no significant difference as seen in Figure 4. This result confirms Nwanna and Oboh (2007*)* assertion that *T. occidentalis* leaf contains high potassium, iron and less of protein. Also *M. pruriens* is claimed to have about 23% protein concentration which may not be high (Janardhanan *et al*., 2003).

The result in Figure 5 showed decrease albumin concentration in animals treated with *M. pruriens* (3.*74*±

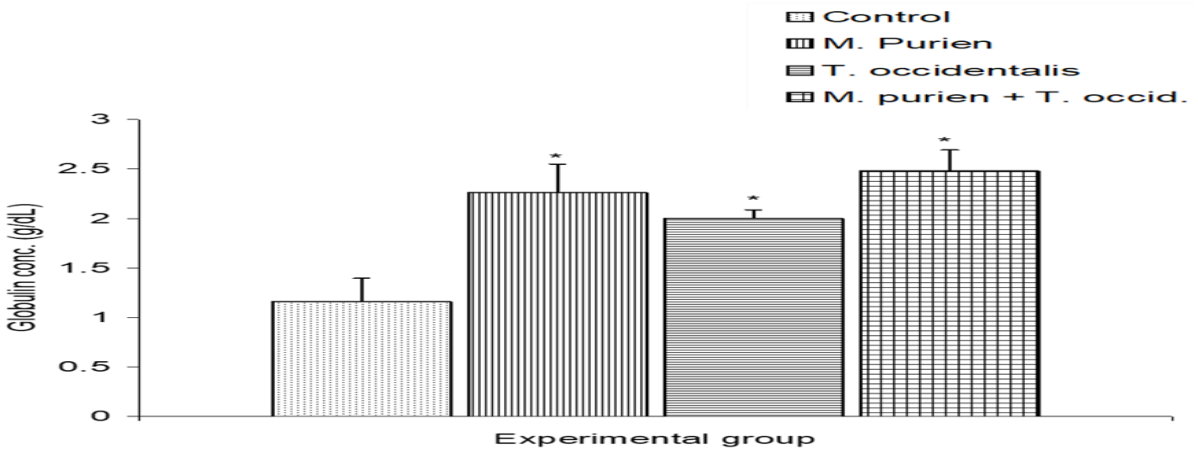

Figure 6. Comparison of globulin concentration in the different experimental groups. Values are expressed as Mean + SME, = 5. *significantly different from control at p<0.05.

0.19* g/dL**)** *and T occidentalis* (3.86±0.19* g/dL) when compared with control (4.56± 0.28 g/dL) in Table 1. Albumin concentration is decreased in both chronic and acute liver disease and protein utilization (Burtis *et al.,* 2006).

The result in Figure 6 showed there was a slight increase in globulin level of *Mucuna pruriens* (6.00 ± 0.23 g/dl) treated animals when compared with the control (5.56 ± 0.20 g/dl). However, there was no significant difference in globulin level of *T occidentalis* treated animals and with animals treated with combination of *M. pruriens* and *T. occidentalis*.

In conclusion, the result of this study showed that the aqueous extract of *T. occidentalis* has high hepatoprotective effect. It also showed that *M. pruriens* even though already known to have haematopoietic properties could be hepatotoxic and can endanger the lives of the animals. The two extract are low in protein.

It was recommended that since M. *pruriens* could be hepatotoxic, combination administration of the two leafs should be avoid. Each leaf can be administered separately to prevent its hepatotoxic effect. Also, *T. occidentalis* is hepatoprotective and highly recommended for use in control of anaemia since large quantity can be taken without negative effect.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

ACKNOWLEDGEMENTS

The authors appreciate Temunah Global Solution for funding most part of the research. Dr Elvis Ajim was also acknowledged for his assistance in the analysis.

REFERENCES

Adepoju, G. K. A., & Odubena, O. O. (2009). Effect of Mucuna pruriens on some haematological and biochemical parameters. *Journal of Medicinal Plants Research*, *3*(2), 73-76.

Ajayi, O. I., Ajayi, T. C., Omokaro, E. D., & Halim, N. K. (2000). Erythropoietic value of Telfairia occidentalis on rabbit: a preliminary study. *Nigerian Journal of Physiological Science*, *16*(1-2), 1-3.

Akindele, A. J., & Busayo, F. I. (2011). Effects of the hydroethanolic extract of Mucuna pruriens (L.) DC (Fabaceae) on haematological profile in normal and haloperidol treated rats. *Nigerian Quarterly Journal of Hospital Medicine*, *21*(2), 93-98.

Anna, L., Fabio, S. M & Antonio, C. (2012). Herbal hepatotoxicity: a hidden epidemic. *Internal and Emergency Medicine*, *8*, 13-22.

Burtis, C. A., Ashwood, E. R., & Bruns, D. E. (2006). *Enzymes*. TIET textbook of clinical chemistry and molecular diagnosis. Elsevier Indian, Pp. 621-29.

Dacie, J. V., & Lewis, S. M. (2002). Practical Haematology (10th edition). Edinburgh, churchil Livingstone.

Eseyin, O. A., Igboasoiyi, A. C., Oforah, E., Mbagwu, H., Umoh, E., & Ekpe, J. F. (2005). Studies of the effects of alcohol extract of Telfairia occidentalis on alloxan induced diabetic rats. *Global Journal Pure and Applied Science*, *11*, 85-87.

Fagbemi, T. N., Oshodi, A. A., & Ipinmoroti, K. O. (2005). Processing effects on some antinutritional factors and in vitro multienzyme protein digestibility (IVPD) of three tropical seeds: Breadnut (*Artocarpus altilis*), cashewnut (*Anacardium occidentale*) and fluted pumpkin (Telfairia occidentalis). *Pakistan Journal of Nutrition*, *4*(4), 250-256.

Fasuyi, A. O. (2006). Nutritional potentials of some tropical vegetable leaf meals: chemical characterization and functional properties. *African Journal of Biotechnology*, *5*(1), 49-53.

Giboney, P. T. (2005). Mildly elevated liver transaminase levels in the asymptomatic patient. *American Family Physician*, *71*(6), 1105-1110.

Janardhanan, K., Gurumoorthi, P., & Pugalenthi, M. (2003).

Nutritional potential of five accessions of a South Indian tribal pulse, *Mucuna pruriens* Var utilis I. The effect of processing methods on the content of l-dopa, phytic acid, and oligosaccharides. *Tropical and Subtropical Agroecosystems*, *1*(2-3), 141-152.

Katzenschlager, R., Evans, A., Manson, A., Patsalos, P. N., Ratnaraj, N., Watt, H., Timmermann, L., Van der Giessen, R., & Lees, A. J. (2004). Mucuna pruriens in Parkinson's disease: a double blind clinical and pharmacological study. *Journal of Neurology, Neurosurgery & Psychiatry*, *75*(12), 1672-1677.

Majekodunmi, S. O., Oyagbemi, A. A., Umukoro, S., & Odeku, O. A. (2011). Evaluation of the anti–diabetic properties of Mucuna pruriens seed extract. *Asian Pacific Journal of Tropical Medicine*, *4*(8), 632-636.

Mengue, S. S., Mentz, L. A., & Schenkel, E. P. (2001). Uso de plantas medicinais na gravidez. *Revista brasileira de Farmacognosia*, *11*, 21-35.

Muhammad, Y. B., Adam, A. A., Jamil, D. U., Lukman, O. A., & Opke, J. M. (2015). Effect of aqueous extract of mucuna pruriens leaves on liver and kidney function markers in wister albino rats. *American Journal of Innovative Research and Applied Sciences*, *1*(10), 379-383.

Nwanna, E. E., & Oboh, G. (2007). Antioxidant and hepatoprotective properties of polyphenol extracts from *Telfairia occidentalis* (fluted pumpkin) leaves on acetaminophen induced liver damage. *Pakistan Journal of Biological Sciences*, 10(16), 2682-2687.

Nworgu, F. C. (2004). Utilization of forage meal supplements in broiler production. Ph.D Thesis, Animal Science Department, University of Ibadan, Ibadan, Nigeria. Pp. 136-160.

Nwozo, S. O., Adaramoye, O. A., & Ajaiyeoba, E. (2004). Antidiabetic and hypolipedepaernic studies of *Telfairia occidentalis* on alloxan induced diabetic rabbits. *Nigerian Journal of Natural Product and Medicine.* 8(1), 37-39.

Ogamba, J. O., Eze, N. A., Ogamba, S. E., & Chilaka, K. C. (2010). Evaluation of haemopoietic properties of aqueous extract of Mucuna pruriens leaf in albino rats. *Tropical Journal of Medical Research*, *14*(2), 60-62.

Ogunmoyole, T., Ola-Awe, A. M., & Fatile, O. G. (2021). Ethanolic extract of Mucuna pruriens leaves ameliorates carbon tetrachloride and rifampicin-induced hepatotoxicity and nephrotoxicity in wistar albino rat. *BMC Complementary Medicine and Therapies*, *21,* Article number 282.

Prashant, T., Bimlesh, K., Mandeep, K., Gurpreet, K., & Harleen, K. (2011). Phytochemical screening and extraction: A review. *Internationale Pharmaceutica Sciencia*, *1*(1), 98-106.

Rathi, S. S., Grover, J. K., & Vats, V. (2002). The effect of Momordica charantia and Mucuna pruriens in experimental diabetes and their effect on key metabolic enzymes involved in carbohydrate metabolism. *Phytotherapy Research*, *16*(3), 236-243.

Saxena, R., Theise, N. D., & Crawford, J. M. (1999). Microanatomy of the human liver—exploring the hidden interfaces. *Hepatology*, *30*(6), 1339-1346.

Si-Tayeb, K., Lemaigre, F. P., & Duncan, S. A. (2010). Organogenesis and development of the liver. *Developmental Cell*, *18*(2), 175-189.

Wang, Y., Xu, Z., Bach, S. J., & McAllister, T. A. (2008). Effects of phlorotannins from Ascophyllum nodosum (brown seaweed) on in vitro ruminal digestion of mixed forage or barley grain. *Animal Feed Science and Technology*, *145*(1-4), 375-395.