

Effect of Aqueous Extracts of *Mangifera indica* linn. on the Testes of Adult Male Wistar Rats

Oluwadara Pelumi Alamu^{1*}, Olusola A. Adeeyo² and Olubukola Oluranti Babalola³

¹Department of Human Anatomy, Faculty of Basic Medical Sciences, Ladoko Akintola University of Technology, Ogbomoso, Oyo state, Nigeria

^{1,2,3}Food Security and Safety Niche Area, Faculty of Agriculture, Science and Technology, North-West University, Private Bag X2046, Mmabatho 2735, South Africa

*E-mail: alamuoluwadara@gmail.com

KEYWORDS: Sertoli Cells. Tunica Albuginea. Spermatogenic Cells. Spermatozoa. Spermatocytes

ABSTRACT The use of various medicinal plants in the treatment and prevention of various ailments especially in developing countries of the world cannot be overlooked. Among these medicinal plants is *Mangifera indica* linn. whose effect on reproductive parameters of male Wistar rats was studied in this research. Adult male wistar rats used in the study were within the weight range 150-175kg, and were divided into two groups - Group 1(G1) rats were untreated and served as control, while Group 2 (G2) were experimental rats and were orally given 10mg/kg of the aqueous extract of *Mangifera indica* for a period of six weeks. In the research, body weight changes were measured throughout the six weeks and it was observed at the end of the sixth week that there was a drastic reduction in the weight of the animals. It was also observed in the micrograph taken that the tunica albuginea and the basement membrane of the seminiferous tubule had been distorted, the sertoli cells and the spermatogenic cells were reduced thereby becoming scanty, there were also little and in some areas no spermatids and spermatozoa, giving a clear hyaline degeneration. It could be concluded from the above observations that *mangifera indica* leaf extract has adverse effects on some male reproductive parameters.

INTRODUCTION

Over the years, various plants have been considered and studied as scientists have looked into natural means of healing to minimize the use of orthodox medicines in the prevention and treatment of various ailments. In fact some pathogens have developed resistance to various medication due to the indiscriminate use of commercial orthodox medicine (WHO 2002). Therefore, extracts from some plants have been considered and it has been discovered that some of these plant extracts have the ability to prevent, while some have the capability to completely cure certain ailments because of their ability to produce certain chemical compounds that defend the body against germs and other pathogens.

These chemical compounds in medicinal plants carry out their effect on the human body in a way similar to that of conventional medicines that is, herbal medicines and conventional medicines operate in an almost similar way, thus making herbs potent in combating various health problems and this also gives them the potential to cause harmful effects as well (Lai and Roy 2004; Tapsell et al. 2006), especially when the wrong concentration is taken or when it is

abused. These herbs are orally administered or can be applied on the skin surface as an ointment. Extracts of roots stem, bark and leaves of some plants have been shown to have activities against most dreaded pathogenic organisms like bacteria and fungi (Nwinuka et al. 2008).

According to Alaribe (2008), about eighty percent of Nigerian families use traditional medicine either singularly or in combination with orthodox medicines in treating both common and life threatening ailments and diseases. Also, some of these plant extracts, like that from snake tomatoes, are used to treat debilitating diseases like diabetes mellitus (Adeeyo et al. 2011), *Apium graveolens*, is used in the treatment of urolithiasis (Alok et al. 2013). *Azadirachta indica* (Neem/dogoyaro) is also a medicinal plant commonly used in the prevention and treatment of all forms of malaria, and extract from its bark can also be combined with that of *Asminatriloba* (pawpaw) leaves and can be used in the treatment of malaria (Ketiku 1976). Another example is the extract from the mango leaf (*Mangifera indica* linn.), which is widely consumed in southwestern part of Nigeria (West Africa) because it is believed to be an antidote and remedy for diabetes mellitus, malaria, enteric fever,

and immune deficiency, and it is grown in various parts of the world especially in the western part of Africa.

It belongs to Division: *Magnoliophyta*, Class: *Magnoliopsida*, Subclass: *Rosidae*, Order: *Sapindales*, Family: *Anacardiaceae*, and Genus: *Mangifera*. Its leaf, root and stem are used for various medicinal purposes. It has recently been reported that the extract of *Mangifera indica* linn. inhibited lipid peroxidation (Badmus et al. 2011), exerted antifungal activity (Kanwal et al. 2010) and exhibited anticarcinogenic action (Severi et al. 2009). *Mangifera indica* linn has also been reported to show moderate antimicrobial activity against Gram positive bacteria and poor activity against Gram negative bacteria (Islam et al. 2010). Despite the fact that the *Mangifera indica* leaf extract is used for herbal medicinal purposes, and there are lots of literature on the benefits of this medicinal plant, there is little or no information on its adverse effects on human health especially on reproductive parameters like histology of the testes, serum testosterone and semen analysis. Due to this paucity of information on *Mangifera indica* leaf extracts and its effect on the reproductive parameters, this study is carried out to know the effects of *Mangifera indica* leaf extracts on the histology of testes of adult male wistar rats.

MATERIAL AND METHODS

Sample Collection

The fresh leaves of *Mangifera indica* were collected from Ogbomoso, Oyo Province of Nigeria and were rinsed thoroughly with clean water immediately after collection.

Preparation of Extract

The extract was prepared by air-drying the *mangifera indica* linn. at room temperature for a period of 30 days after which it was blended into powder form and soaked in distilled water that is, 200g of the powdered leaf was dissolved in 2000ml of distilled water and left for 24 hours. After 24 hours, the mixture was shaken and then filtered through a Whatman No. 1 filter paper to get the filtrate and the residue. The filtrate was then evaporated to powder form again and weighed giving 65g. The remaining 65g of the powdered extract was then dissolved in 650ml

of distilled water because at first, 200g of the grounded mango leaf was dissolved in 2000ml of distilled water that is, 100g of the leaf was dissolved in 1000g of distilled water, so if 100g of leaf was dissolved in 1000ml of distilled water, then 65g of the leaf will be dissolved in 650ml of distilled water.

Animal Grouping and Treatment

Ten rats with average weight ranged between 150-175g were used for this experiment.

- The first group (G_1), which was the control group, consisted of five male wistar rats.
- The second group (G_2), which was the treated group, consisted of five male wistar rats.

The animals in both groups were exposed to food (animal feed) and water ad libitum. Group one (G_1) animals were given only distilled water, while group two (G_2) animals were given 10mg/kg LD50 (Adeeyo et al. 2011) of the *Mangifera* leaf extract. All the treatments were given orally for six weeks. The animals were weighed daily and the weekly average was recorded. The quantity of food taken by each group was recorded.

Harvesting of Organs

After the six weeks of administration of the extracts, the animals were sacrificed by cervical dislocation and the testes were harvested and placed in ten percent Formosaline.

Tissue Processing

The testes were fixed in ten percent Formosaline to prevent autolysis and putrefaction, and it was then passed through the dehydration, clearing, infiltration, embedding, sectioning and staining processes. After which the slides are examined under a microscope and photomicrographs taken.

RESULTS AND DISCUSSION

Statistical Analysis

The weights of the animals were recorded daily in grams (g) and the weekly averages are represented in Table 1. The results were presented as the Mean $\pm$ SEM (Standard Error) and

statistical significance between the groups was determined by means of a student's t-test to determine statistical significance (Table 2).

Table 1: Average weight of the animals at the end of each week

Weeks	Control (G_1)	Treated (G_2)
0	160.00	160.00
1	163.80	163.00
2	165.60	163.00
3	167.00	159.00
4	169.60	155.60
5	168.40	151.80
6	170.80	147.20

Table 2: Mean and standard error of mean of the weight of the animals

Weeks	Control group (G_1) Mean $\pm$ SEM	Treated group (G_2) Mean $\pm$ SEM
0	160.00 $\pm$ 5.24	159.00 $\pm$ 4.58
1	162.80 $\pm$ 5.56	163.00 $\pm$ 5.15
2	165.60 $\pm$ 6.11	163.00 $\pm$ 5.15
3	167.00 $\pm$ 6.03	159.00 $\pm$ 5.38
4	169.60 $\pm$ 6.01	155.60 $\pm$ 5.03
5	163.40 $\pm$ 3.67	151.80 $\pm$ 5.08
6	170.80 $\pm$ 3.77	147.20 $\pm$ 5.39

At the end of the first week, an increase in weight of the animals was observed, at the end of the second week, the weight remains constant and at the end of the third week, the weight continues to fall (decrease). This implies that the extract of *mangifera indica* leaf affected the weight of these experimental animals.

The H and E staining of the testes of the control group as shown in showed that the normal basement membrane of seminiferous tubule and the tunica albuginea is intact. The seminiferous tubule contains a significant number of sertoli cells, spermatogonic cells, spermatids and spermatozoa. All these are keeping with the normal histological findings of the testes.

In *Mangifera indica* linn extract treated animals as shown in the histology of the testes showed scanty sertoli cells and spermatogonic cells. There were scanty and in some areas distorted/no spermatids and spermatozoa, giving a clear hyaline degeneration. These observations in the treated group are in conformity with those of Azu et al. (2010), which led them to conclude that the ability of any drug or agent to exert its toxic effects on the testes depends on its ability

to permeate the physiological blood testes barrier. Furthermore, there was a significant reduction in the weight's p-value ≤ 0.05 in treated groups when compared to the control. This is keeping with the fact that mango leaf extracts prevent absorption of glucose in the gastrointestinal system (Nahar et al. 2000). The prevention of glucose absorption deprives the body of an essential source of energy. The body will then depend on fat as an alternative source of energy, thus leading to loss of weight as seen in the treated animals.

CONCLUSION

The histological analysis showed that the administration of *Mangifera indica* leaf extract caused an adverse effect on the testis and also affected the weight of the animals causing a drastic and significant reduction in weight. The reduction in weight was because mango leaf extracts prevents absorption of glucose in the gastrointestinal system making the body to depend on fat as an alternative source of energy therefore causing loss of weight seen in the treated animals. All these findings imply that the use of these extracts in self-medication for the treatment of various ailments as practiced in the developing parts of the world, mostly the rural areas, may not be completely safe for the human health since it is usually taken/consumed without confirming its concentration.

RECOMMENDATIONS

This study therefore recommends that more research should be conducted on medicinal plants especially *mangifera indica* to harness the importance and benefits of these plants over orthodox medicines and to also discover more of the adverse effects of this plant on man. Finally, the researcher recommends working together of the traditional health practitioners and the experts of orthodox medicine in other to achieve holistic healthcare delivery.

REFERENCES

- Adeeyo OA, Ogundare O, Salawu EO, Saka WA, Adeleke GE, Onaolapo OJ 2011. Oral administration of aqueous extract of *Trichosanthes cucumerina* may prevent diabetic renal abnormalities. *World J Young Researchers*, 1: 4.

- Alaribe SI 2008. *A Survey of the Importance and Problems of Traditional Health Care Medicine: A Case Study of Ezinihitte Mbaise L.G.A. Imo State*. BSc Project, Unpublished. Owerri/Nigeria:Imo State University.
- Alok S, Jain SK, Verma A, Kumar M, Sabharwal M 2013. Pathophysiology of kidney, gallbladder and urinary stones treatment with herbal and allopathic medicine: A review. *Asian Pacific Journal of Tropical Disease*, 3(6): 496-504.
- Azu O, Duru F, Osinubi A, Noronha C, Elesha S, Okanlawon A 2010. Preliminary study on the antioxidant effect of *Kigelia africana* fruit extract (Bignoniaceae) in male Sprague-Dawley rats. *African journal of Biotechnology*, 9(9): 1374-1381.
- Badmus JA, Adedosu TO, Fatoki JO, Adegbite VA, Adaramoye OA, Odunola OA 2011. Lipid peroxidation inhibition and antiradical activities of some leaf fractions of *Mangifera indica*. *Acta Pol Pharm*, 68: 23-29.
- Islam M, Mannan M, Kabir M, Islam A, Olival K 2010. Analgesic, anti-inflammatory and antimicrobial effects of ethanol extracts of mango leaves. *Journal of the Bangladesh Agricultural University*, 8(2): 239-244.
- Kanwal Q, Hussain I, Latif SH, Javaid I 2010. Antifungal activity of flavonoids isolated from mango (*Mangifera indica* L.) leaves. *Natural Product Research*, 24(20): 1907-1914.
- Ketiku AO 1976. Chemical evaluation of the nutritive value of varieties of Banana (*Musa sapientum*) Linn grown in Nigeria. *Journal of the Association for the Advancement of Agricultural Sciences in Africa*, 3(2): 53-56.
- Lai PK, Roy J 2004. Antimicrobial and chemopreventive properties of herbs and spices. *Current Medicinal Chemistry*, 11(11): 1451-1460.
- Nahar N, Rokeya B, Ali L, Hassan Z 2000. Effects of three medicinal plants on blood glucose levels of non-diabetic and diabetic model rats. *Diabetes Research*, 35(2): 41-49.
- Nwinuka NM, Monanu MO, Nwilo BI 2008. Effects of aqueous extract of *Mangifera indica* L.(Mango) stem bark on haematological parameters of normal albino rats. *Pakistan Journal of Nutrition*, 7(5): 663-666.
- Severi JA, Lima ZP, Kushima H 2009. Polyphenols with antiulcerogenic action from aqueous decoction of mango leaves (*Mangifera indica* L.). *Molecules*, 14(3): 1098-1110.
- Tapsell LC, Hemphill I, Cobiac L, Sullivan DR, Fenech M, Patch CS, Roodenrys S, Koegh JB, Clifton PM, Williams PG 2006. Health benefits of herbs and spices: The past, the present, the future. *Medical Journal of Australia*, 185(4): 1-24.
- WHO 2002. WHO launches the First Global Strategy on Traditional Medicine. *Press Release WHO/38*.