J. Expt. & Clin. Anat. 8(1): 28-31

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Effects of A Diet Containing *Garcinia Kola* Seeds on The Liver of Adult Male Wistar Rats.

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ABSTRACT
This study aims at investigating the in vivo effect of *Garcinia kola (G. kola)* seeds on the histology, and glycogen storage action of the liver of adult male albino wistar rats. Forty (40) adult male albino wistar rats were used in this study. They were procured from the Animal House of the Faculty of Pharmaceutical Sciences, University of Nigeria Nsukka. They were acclamatised to the conditions of the Animal House of the College of Medicine, University of Nigeria Teaching Hospital, Enugu. They were divided into four (4) groups of ten (10) each. Groups I, II, and III were fed with growers mash mixed with *G. kola* powder at 30%, 20%, and 10% w/w respectively. Group IV (control) was fed ad libitum with normal diet of growers mash produced by Top Feeds® Plc. The experiment lasted for ten (10) weeks. At the end of the experimental period, the animals were euthanised by chloroform inhalation and their liver dissected out and processed for H&E, and Best Carmine stains. The cell morphology of the hepatocytes was not deranged due to consumption of *G. kola* seed. The Best Carmine stained slides showed a dose dependent increase in the glycogen storage activity of the liver. The implications of these changes are discussed.

KEYWORDS: G.kola, Biflavonoids, Liver, Glycogen.

Medicinal plants have been identified to be important for pharmacological research and drug development. The plant constituents may be used directly as therapeutic agents, as basic raw materials for the synthesis of drugs or as models for pharmacologically active compounds (Murray 1995 WHO 1996). These medicinal plants are used either as diet supplements or as extract, from the various parts of the plant.

Garcinia kola (Heckel) otherwise called bitter kola has been identified as medicinal against many diseases. The seeds have been reported to be useful in relieving dysentery and diarrhoea (Ainslie 1973), respiratory decongestion (Orie & Ekon 1993) treatment of asthma (Ebomoyi 1995), laryngitis (Iwu et al, 1990), its use as antimicrobial/antibacterial agent was reported by Akoachere et al (2002), Ebana et al (1991), and Madubunyi (1995). *G. kola* seeds have also been demonstrated to be antidotes to poison (Farombi et al 2000). Iwu et al (1990) reported that it protected rats from thioacetamide induced hepatotoxicity and that the kolaviron, an extract from the seeds of *G. kola* show anti-diabetic and aldose reductase activities in rats. The studies of Iwu et al (1990), Waterman and Hussain (1992) and Osisiogu (1964) identified biflavonoids as active ingredients in the seeds of *G. kola*. Bearing in mind the medicinal uses, people consumed it as kola substitute, medicine, or junks and snacks in large quantity. This may not be proper because some herbs that proved medicinal on one occasion may prove toxic on others. For example a herb Ma Huang is used in China to treat short-term respiratory disorders. But in USA, it was marketed as a dietary aid whose long-term use led to at least a dozen deaths, heart attack and strokes (WHO 1998, Samenuk et al 2002 Morgenstern 2003). Meanwhile, there is the need to investigate the possible effects of *G.*

kola seeds on body organs.

This study aims at investigating the effects of consumption of *G. kola* seeds on the cell morphology and glycogen storage capacity of the liver of adult wistar rats.

MATERIALS AND METHOD

Breeding of Animal

Forty (40) male Albino wistar Rats were purchased from the Animal House of the Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka. They were divided into four (4) groups I, II, III and IV with ten (10) rats in each group properly kept in cages with screened tops. The animals were acclamatised to the conditions of the Animal House of the College of Medicine, University of Nigeria Teaching Hospital, Enugu, for a period of two (2) weeks. Within this acclimatization period, they were fed ad libitum with growers mash produced by Top Feeds® Plc. Groups I, II and III were fed with 30%, 20% and 10% w/w, respectively of *G.* kola diet. Group IV (control) was fed with normal feed. At the end of the experimental period of ten (10) weeks, the animals were euthanised by chloroform inhalation. With scapel blade, a pair of forceps and a pair of dissecting scissors, the abdominal cavity was exposed and the liver was dissected out and fixed immediately in Carnoy's fluid for twenty-four (24) hours. Subsequently, the tissues were routinely processed. H&E and Best carmine stains were carried out on the processed tissues.

RESULTS

Histological Observations

The H and E stained histological sections of the liver showed no alteration in cellular morphology in all the experimental groups 1-2 and III, (Figs 1-3), when compared with the control group, (Fig 4). Fig 1 shows photomicrograph of H & E stained liver of group I (30% w/w) x 100. The section shows nothing of pathological significance. Fig 2 shows photomicrograph of H & E stained liver of group II (20% w/w) x 100. The section has normal architecture. Fig 3 shows photograph of H & E stained liver of group III (10% w/w) x 100. The section shows features of no pathological significance Fig 4 shows photograph of H & E stained liver of group IV (control) x 100. The section shows normal architecture.

Histochemical Observations

The Best Carmine stained sections of the liver showed a dose dependent increase in glycogen storage (Figs 5-8). Fig 5 shows photomicrograph of Best Carmine stained liver of group I (30% w/w) x 100. Section shows increased glycogen storage in the hepatocytes. Fig. 6 shows photomicrograph of Best Carmine stained liver of group II(20% w/w) x 100. Section shows a gradual decrease in glycogen storage. Fig 7 shows photomicrograph of Best Carmine stained liver of group III (10% w/w) x 100. Section shows a continuous gradual decrease in glycogen storage. Fig 8 shows photomicrograph of Best Carmine stained liver of group IV (control) x 100. Section shows a marked relative decrease in glycogen storage.

DISCUSSION

The doses administered over the experimental period in this study showed no cellular derangement in the liver. *G. Kola* seeds have been demonstrated to be an effective antihepatotoxic agent (Farombi et al 2000, Iwu et al 1990). Ipso facto, there is every tendency that *G. kola* seeds itself will not cause damaging to the cells of the liver. This study demonstrates that *G. kola* seeds containing diet shows no deleterious effect on the liver. Therefore the ingestion of the specified quantities of *G. kola* seeds is not harmful to the liver.

The liver is a good organ for demonstration of glycogen because the hepatocytes are rich in glycogen (Culling et al 1984). The role of the liver in carbohydrate metabolism by converting glucose from blood to glycogen in tissue (glycogenesis) and re-conversion of this glycogen from tissue to glucose in blood (gluconeogenesis) has been stated (Krause 1996, Stuart 1999, Guyton and

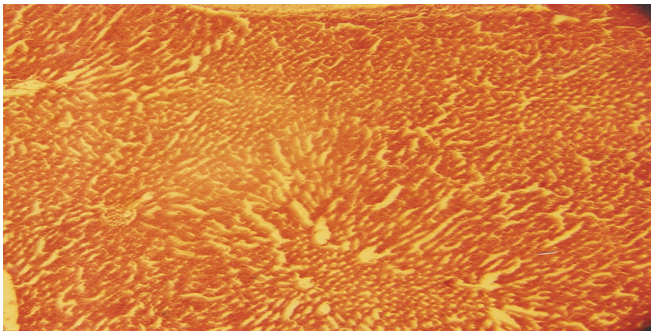

Fig 1: H & E Stain of groupI (30% w/w)x 100 Normal architecture.

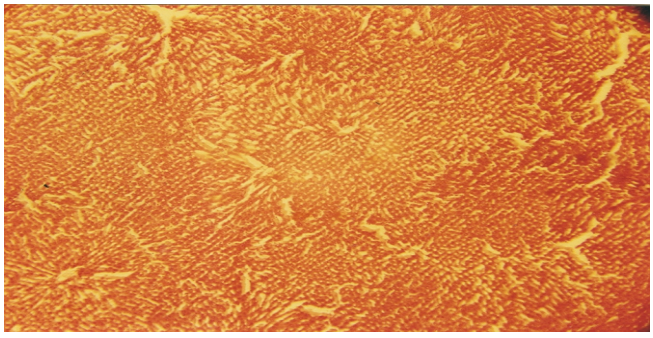

Fig 2: H & E Stained liver of groupII (20% w/w) x 100 Normal architecture.

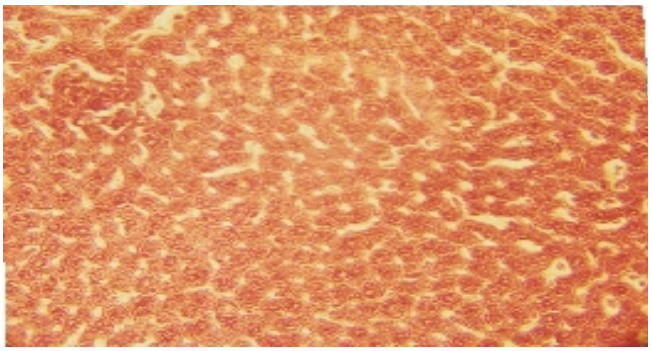

Fig 3: Photograph of H&E stained liver of group III (10% w/w) x 100 Normal achitecture.

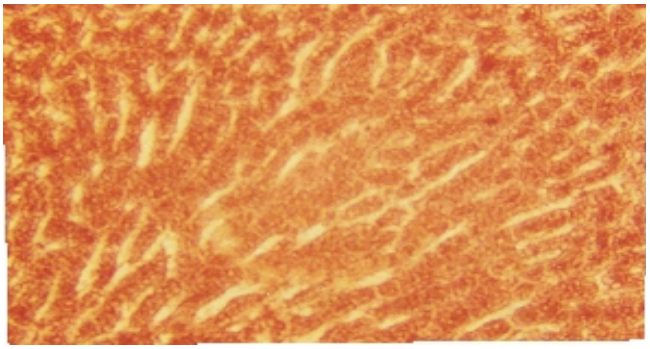

Fig 4: Photograph of H&E stained liver of group IV (control) x 100 Normal achitecture.

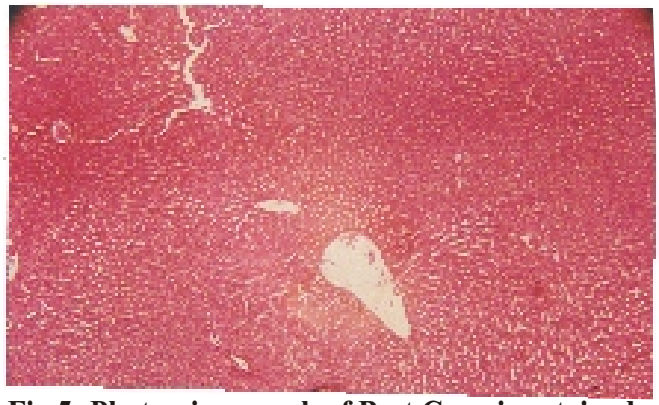

Fig 5: Photomicrograph of Best Carmine stained liver of group I (30% w/w) x 100. Section shows increased glycogen storage in the hepatocytes.

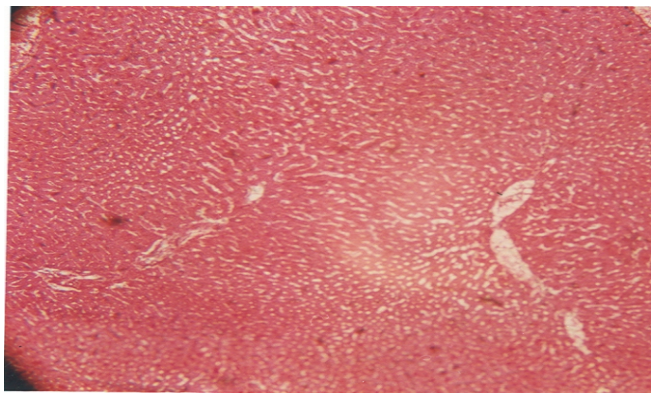

Fig 6: Photomicrograph of Best Carmine stained liver of group II (20% w/w) x 100. Section shows a gradual decreased in glycogen storage.

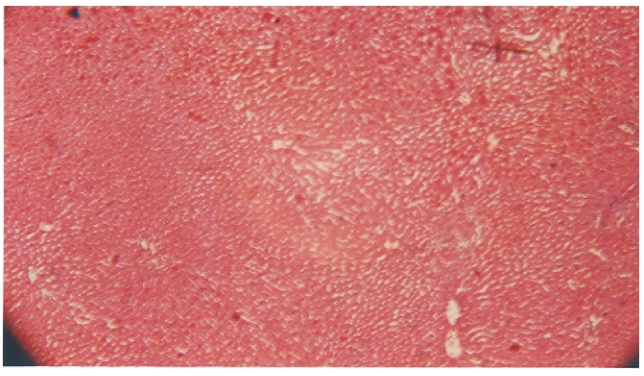

Fig 7: Photomicrograph of Best Carmine stained liver of group III (10% w/w) x 100. Section shows a continuous gradual decrease in glycogen storage.

Fig 8: Photomicrograph of Best Carmine stained liver of group III (control) x 100. Section shows a marketed relative decrease in glycogen storage.

Hall 2000). The results of this study showed a dose dependent increase in glycogen storage activity of the liver. Therefore, consumption of *G. kola* seeds enhances glycogenesis.

Esom *et al* (2006) showed that there was a decrease in blood glucose level of adult male wistar rats administered with a diet containing *G. kola* seeds. This blood glucose level falls as the doses of *G. kola* diet increases. That is to say that as the doses of *G. Kola* diet increases, glycogenesis increases, as demonstrated in this study and blood glucose level falls as shown in Esom et al (2006). Glucose is needed by the body for the production of energy. However blood glucose needs to be regulated and maintained at a certain level otherwise it constitutes diabetes mellitus which is a debilitating condition. According to Felig (1975) van de Werve (1987) Harris and Crabb (1992) Fischbach (1996) and Stuart (1999) one of the principal mechanisms of blood glucose regulation is glycogenesis. The increase in glycogenesis following consumption of *G. kola,* in this study and a decrease in blood glucose as reported by Esom *et al* (2006) is in line with the report of Krause (1996) Stuart (1999) and Guyton and Hall (2000). This goes to suggest an explanation to the anti-diabetic uses of *G. kola* seeds as reported by Iwu et al (1990). In the same vein, we can comfortably infer that *G. kola* seeds enhance the glycogen storage activity of the liver.

ACKNOWLEDGEMENT

The authors acknowledge the assistance of the Animal House staff of the College of Medicine, UNTH, and the technical assistance given by A.A. Ngokere of Morbid Anatomy Department of University of Nigeria, Enugu Campus.

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