



**COMPARATIVE EVALUATION OF LEAF AND FRUIT EXTRACT OF *Cucumis sativus*
ON LIVER FUNCTION PARAMETERS OF ADULT MALE WISTER RAT**

Egbiremhon B. O.^{1*}, Nnaoma I. E.², Joseph R. C.², Joel O.³ and Oguebie R. N.²

¹Department of Dispensing Opticianry, Federal Polytechnic Nekede Owerri.

²Department of Pharmaceutical Technology, Federal Polytechnic Nekede Owerri.

³Department of Biochemistry/Microbiology, Federal Polytechnic Nekede, Owerri.

*Corresponding Author: Egbiremhon B. O.

Department of Dispensing Opticianry, Federal Polytechnic Nekede Owerri.

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ABSTRACT

This study was designed to evaluate the comparative effect of *Cucumis sativus* leaf and fruit juice on the liver of albino rats. 50 wistar albino rats having an average mean weight were divided into five groups consisting of Ten (10) animals in each group. Group A served as normal control, and groups B, C, D, and E served as test groups administered with low and high doses of *Cucumis sativus* leaf extract and fruit juice. The experimental period lasted for Twenty-eight (28) days after which the animals were sacrificed and their blood collected for analysis. The liver function test was evaluated by determining the concentration in serum ALT, AST, ALP, Bil, TP, and Glob spectrophotometrically. The result obtained was presented as mean \pm SEM. The result of the present study revealed for the Total proteins (TP) and Albumin (ALB) that the fruit juice extract was significantly different ($P < 0.05$) from the normal control group and those treated with the leaf extract. The Globulin level of the treated rats with the leaf extract and fruit juice was not significantly different ($P > 0.05$) from the normal control groups. The AST level of rats treated with a high dose of leaf extract (800mg/kg) was significantly different ($P < 0.05$) from the control group and groups treated with fruit juice. However, there was a significant difference ($P < 0.05$) in the ALT level of groups treated with leaf extract and fruit juice when compared to the control group. ALP levels among the treated and control rat groups showed a no significant ($P > 0.05$) difference suggesting no changes in the ALP levels. Bilirubin levels of rats treated with fruit juice were not significantly different ($P > 0.05$) from the control group and group treated with a high dose (800mg/kg) of the leaf extract but groups treated with low dose (400mg/kg) of leaf extract were significantly different ($P < 0.05$) from the control group and group treated with fruit juice. The findings of this study reveal that *Cucumis sativus* leaf and fruit juice extract are safe and non-toxic for the liver.

KEYWORDS: *Cucumis sativus*, Liver, Herbal Medicine, Medicinal plants.

INTRODUCTION

For as long as can be remembered, man has relied on plants as a source of food and in his continued attempt to find solutions to his numerous health challenges. The use of herbs to treat diseases is well documented in the history of man and of the practice of medicine. People of diverse background and culture have indulged in this practice since human existence and still do. The many side effects and exorbitant costs associated with the use of current drugs available for the management of disorders may be the reason for the renewed interest in herbal medicine (Zampini *et al.*, 2009), hence the exploitation of wild plants for medicinal purposes has continued to grow and is accepted globally (Oluwole and Peter, 2011).

Toxicity, which refers to the unpleasant effects brought on by toxicants and cells interacting, is the state of being

poisonous. "The chemical characteristics of the toxicants and the cell membrane may influence this interaction. The harmful effects may occur before the toxicants bind to key organs such as the liver and kidneys. As a result, assessing a substance's hazardous qualities is critical when deciding whether or not to recommend it for public use. In practice, acute, sub-chronic, chronic, carcinogenic, and reproductive impacts are all evaluated" (Nonyelum *et al.*, 2016). A new sort of interaction that could result in unfavorable, occasionally deadly, effects is possible after the injection of a certain chemical agent into a biological system. To evaluate the safety of novel pharmaceuticals and herbal compounds that are in development, toxicological studies are now required. The primary basis for the regulatory safety assessment of natural herbal products is published data about adverse reactions and toxicity.

The regular intake of cucumber fruit promotes healthy hair growth. It is useful for skin problems, sunburn, and also for curing swelling under the eye. Its juice is also efficient to soften the skin texture. Placing two slices of cucumber on the eyes for 10 minutes can decrease the inflammation significantly. It is also beneficial for curing skin infections like eczema. In sunstroke pieces of cucumber are placed on the head so that the patient may breathe moistened air in order to neutralize heat of his body. Fruit is also considered important for weight loss. Traditionally seed were used to expel the intestinal worms and tapeworms. The remedy is carried out when mashed seeds mixed with sugar that should be taken before any meal. Leaves are boiled and mixed with cumin seeds, roasted and powdered, are administered in throat infections in the doses of 30 grams or more (Shrivastava *et al.*, 2013). Kashif *et al* reported that due to elevated content of potassium (50-80 mg/100g), cucumber can significantly be helpful for both high and low blood pressures (Kashif *et al.*, 2008). It is very necessary to search for safe and potent herbal medications that have to be validated by traditional users in order to standardize them by assessing their efficacy and safety through scientific validations (Chethankumara *et al.*, 2021). This present study therefore reveals effect of Evaluation of Hepatotoxicity Effect Aqueous Extract of *Cucumis sativus* leaf and Fruit Juice in Albino Rats.

MATERIALS AND METHOD

Collection of plant materials

Fresh leaves and Fruits of *Cucumis Sativus* was collected from fallow grassland in Umuahia, Umuahia Local Government Area of Abia State, Nigeria and was authenticated at the Department of Forestry, College of Natural Resources and Environmental Management, Michael Okpara University of Agriculture, Umudike.

Preparation of extracts

Leaf

The leaf extract was prepared according to the method used by Jensen, (2007). The collected fresh leaves of *Cucumis sativus* was dried under shade for 14 days, after which they were pulverized to powder using a manual blender. Fifty (50) grams of the powdered sample were introduced into the extraction chamber of the Soxhlet extractor and extraction was done using ethanol as solvent. Temperature was maintained at 60°C throughout the extraction period of 48 hours. At the end of the period, the collected extract in ethanol was dried in a laboratory oven at 40°C to obtain an extract of 9.4g, which was preserved in a freezer at very low temperature until needed, after ascertaining its percentage yield.

$$\% \text{ Yield} = \frac{X}{Y} \times 100\%$$

Where X = weight of prepared and dried extract

Y = weight of powdered plant material before extraction

$$\text{Therefore, the } \% \text{ Yield} = \frac{9.4\text{g}}{50\text{g}} \times 100\%$$

= 18.8%

1g of dried extract was dissolved in 10ml of water to give a stock solution of 0.1g/ml (100mg/ml).

Fruit

The fruit was crushed and juice extractor was used to extract the juice. Water content was evaporated at low temperature to obtain solid sample.

Animals

For the study, 50 male rats were obtained from the Animal production unit of the College of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike and used. The animals were housed under specific pathogen free (SPF) conditions and were provided standard feed (Vital feed, Nigeria) and water ad libitum, but starved for 12 hours prior to commencement of experiments. All animal experiments were carried out in compliance with NIH guidelines for Care and Use of Laboratory Animals (Pub. No. 85-23, Revised 1985), (OECD, 2001). The study was carried out in the Physiology Laboratory of the Department of Physiology and Pharmacology, College of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike, Nigeria where ethical approval was also obtained.

Grouping of Animals and Treatment for safety evaluation

Fifty male rats were divided into 5 groups of ten rats each. Each group was housed in an aluminum cage and assigned treatment in the order below:

Group 1: Control

Group 2: High dose of leaf extract (800mg/kg)

Group 3: Low dose of leaf extract (400mg/kg)

Group 4: High dose of fruit extract (800mg/kg)

Group 5: Low dose of fruit extract (400mg/kg)

Treatment was done by the oral route by gavage and lasted for thirty (30) days during which body weights was taken at the beginning and end of treatment. At the end of treatment rats were sacrificed for blood collection by cardiac puncture into K3 EDTA and plane bottles for liver assay analysis.

Biochemical analysis

Serum analysis

Serum liver markers aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), Total Protein (TP), Albumin, Bilirubin and Globulin were measured using semiautomated biochemistry analyzer according to the procedure of Ayza *et al.* (2020) and Ekam and Udosen (2012).

Statistical analysis

Statistical analysis was carried out using SPSS version 23 for Windows (IBM Statistics for Social Sciences). One-way analysis of variance (ANOVA) followed by Duncan's posthoc test for multiple comparisons was performed to determine differences between treatment groups. A p-value less than 0.05 was considered statistically significant. Results were expressed as mean \pm standard error of the mean (SEM).

RESULTS

Liver function parameters

| Treatments | Control | 400 mg/kg leaf extract | 800 mg/kg leaf extract | 10 ml/kg fruit juice | 20 ml/kg fruit juice |
|-------------------|---------------------------|---------------------------|--------------------------|--------------------------|--------------------------|
| TP (g/dl) | 6.53±0.25 ^a | 6.79±0.21 ^a | 6.78±0.27 ^a | 7.15±0.16 ^b | 7.30±0.21 ^b |
| ALB (g/dl) | 3.52±0.27 ^a | 3.51±0.25 ^a | 3.50±0.20 ^a | 3.92±0.13 ^b | 3.96±0.06 ^b |
| Glob (g/dl) | 3.01±0.36 ^a | 3.28±0.20 ^a | 3.28±0.09 ^a | 3.24±0.09 ^a | 3.34±0.19 ^a |
| AST (U/L) | 36.50±2.38 ^a | 37.50±2.65 ^a | 44.75±2.22 ^b | 35.50±4.04 ^a | 33.75±1.50 ^a |
| ALT (U/L) | 28.75±1.50 ^{a,b} | 33.75±3.50 ^{b,c} | 32.00±2.16 ^c | 26.25±1.26 ^a | 26.25±4.35 ^a |
| ALP (U/L) | 82.50±1.92 ^a | 82.75±1.71 ^a | 82.50±4.36 ^a | 79.75±2.06 ^a | 81.25±2.75 ^a |
| Bilirubin (mg/dl) | 0.55±0.07 ^a | 0.67±0.05 ^c | 0.64±0.04 ^{b,c} | 0.59±0.04 ^{a,b} | 0.58±0.02 ^{a,b} |

Values are expressed as mean ± standard deviation (n = 4), and values with unlike superscripts are significantly (p<0.05) different from paired mean across the row.

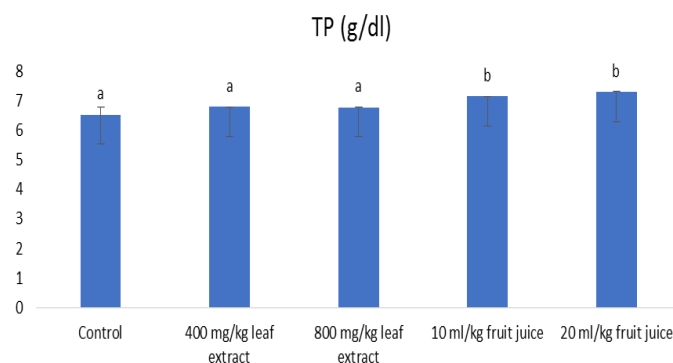


Fig. I: Effect of leaf Extract and Fruit juice of *Cucumis sativus* on serum TP level in albino rats.

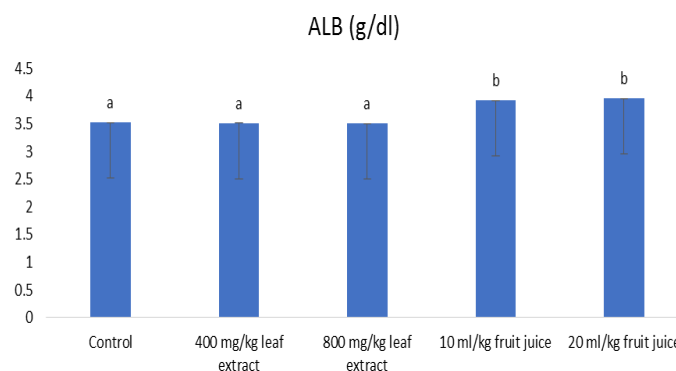


Fig. II: Effect of leaf Extract and Fruit juice of *Cucumis sativus* on serum ALB level in albino rats.

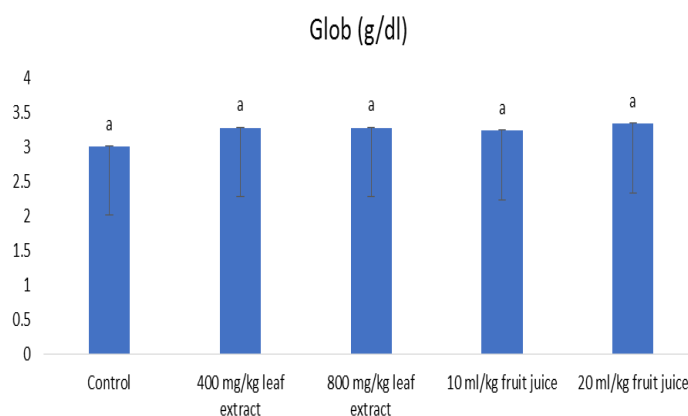


Fig. III: Effect of leaf Extract and Fruit juice of *Cucumis sativus* on serum Glob level in albino rats.

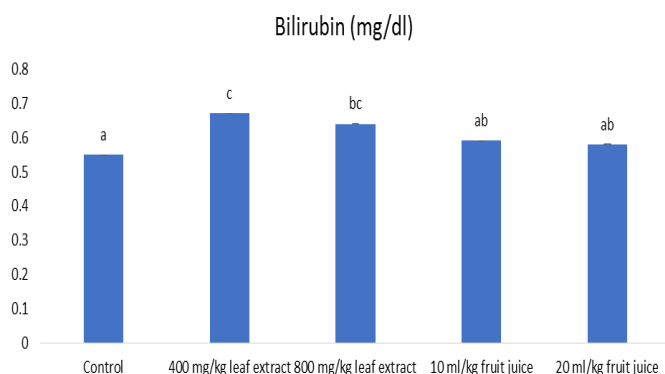


Fig. IV: Effect of leaf Extract and Fruit juice of *Cucumis sativus* on serum Bil level in albino rats.

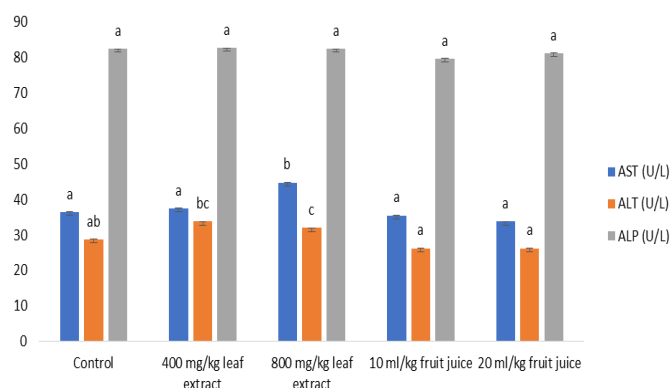


Fig. V: Effect of leaf Extract and Fruit juice of *Cucumis sativus* on serum AST, ALT and ALP level in albino rats.

DISCUSSION

Since herbal treatments are non-toxic, both conventional healers and the general population have used them for millennia to treat a wide range of illnesses. Herbal extracts, despite being of natural origin, are not always thought to be safe. Similar to the active ingredients found in conventional or manufactured drugs, plants also have substances that have therapeutic benefits. These are referred to as phytochemicals (Gospel Ajuru *et al.*, 2018). The demand for toxicological screening is supported by the expanding use of medicinal plants in supplementary medicine. The goal of the current study was to assess *Cucumis sativus*'s biochemical toxicity profile at various doses (Fowotade *et al.*, 2017). Liver enzymes such as TP, Glob, Bil, AST, ALT and ALP are marker enzymes for liver function and integrity. These enzymes are usually elevated in acute hepatotoxicity or mild hepatocellular injury, but tend to decrease with prolonged intoxication due to liver damage (Adebiyi *et al.*, 2021; Fowotade *et al.*, 2017). Various enzymes that are typically found in the cytosol are released into the bloodstream when the liver cell membrane is disrupted (Rao, 2006). The result of the present study revealed for the Total proteins (TP) and Albumin (ALB) that the juice fruit extract was significantly different ($P < 0.05$) from the normal control group and those treated with the leaf extract. Nonetheless, the group treated with leaf extract and the normal control was insignificantly different ($P > 0.05$) from each other. Also, the present study

revealed that the Globulin level of the treated rats with the leaf extract and fruit juice was not significantly different ($P > 0.05$) from the normal control groups, which suggests that both extracts had no activity on the globulin level of the rats. The AST level of rats treated with a high dose of leaf extract (800mg/kg) was significantly different ($P < 0.05$) from the control group and groups treated with fruit juice. Also result revealed that there was no significant change ($P > 0.05$) between control groups, low dose group of the leaf extract and the groups treated with the fruit juice both at low and high dose. However, the ALT level of the control rat group and the group treated with fruit juice was not significantly different ($P > 0.05$) from each other but the group treated with leaf extract at low & high dose showed some significant difference ($P < 0.05$) when compared to the normal control and fruit juice treated rats. ALP levels among the treated and control rat groups showed a non-significant ($P > 0.05$) difference suggesting no changes in the ALP levels. Bilirubin levels of rats treated with fruit juice were not significantly different ($P > 0.05$) from the control group and group treated with a high dose (800mg/kg) of the leaf extract but groups treated with leaf extract were significantly different ($P < 0.05$) from the control group and group treated with fruit juice.

Cucumis sativus (Cucumber) has been found as suitable functional food for medicinal purposes such as diabetes, hyperlipidemia, hypertension (as a diuretic), gall bladder

stones, constipation, and dyspepsia (Robert *et al.*, 2012). The total protein, albumin, and globulin levels may decrease due to liver dysfunction, malnutrition and malabsorption, diarrhea, nephrosis, alpha-1-antitrypsin deficiency, acute hemolytic anemia, hypogammaglobulinemia/ agammaglobulinemia; severe and loss through the urine in severe kidney disease and pregnancy (Ekam & Udosen, 2012). The result of the study showed a significant increase in TP and ALB levels in rats treated with fruit juice which is a good indicator that it could be a potent agent for managing liver disease. Prolonged destruction of the hepatic cells results in more hepatic releases to exacerbate hepatic dysfunction and causes a decrease in the serum levels of total protein, albumin, and globulin (Ekam & Udosen, 2012). The findings of this study suggests that *Cucumis sativus* has no toxic effect on the liver which was in agreement with a recent study of Mohammed *et al* (2021). Furthermore, Serum ALT level and AST are commonly measured to determine hepatitis and hepatocellular damage possibly due to toxic substances such as drug and infectious agents (Olaniyan and Ateni, 2018). The findings of Olaniyan and Ateni (2018) revealed hepatoprotective raw cucumber fruit juice as there was no significant biochemical alterations when the rabbits were co-administered with raw cucumber fruit juice and amoxicillin overdose bioactivities while increase in plasma GST, AST, ALT, and decrease in albumin in amoxicillin overdose was reversed to normal plasma levels when the rabbits were given raw cucumber fruit juice which further lends credence to the health promoting benefits of Cucumber in this study.

CONCLUSION

As a result of its effects on liver in albino rats, the current study reveals that *Cucumis sativus* leaf and fruit juice extract are safe and non-toxic for the liver. Due to economic difficulty, particularly in third-world nations, and the perception that there are no negative side effects, herbal treatment is becoming increasingly popular. To find a balance between curative and safety, this study is an eye-opener on the critical necessity to do thorough toxicity analyses of all our therapeutic herbs.

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