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EFFECT OF BANANA, APPLE, AND PINEAPPLE ON SEX HORMONES IN MALE WISTAR RATS TREATED WITH MONOSODIUM GLUTAMATE

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Abstract:
Sex hormones are important in developing and maturation of sex cells. In male, the sex hormone is testosterone and this hormone is produced by the testes with control from the hypothalamus through the release of gonadotropin releasing hormone (GnRH). The hormone testosterone promotes spermatogenesis in male and thus enhance reproductive process in male. Fruits combination is well eaten across the world and it increases sperm parameters. The study aimed to evaluate the Effect of Banana, Apple, and Pineapple on Sex Hormones in Male Wistar Rats Treated with Monosodium Glutamate. The study involved 30 Male Wistar rats (weighing 130-180g) randomly selected into five groups with 6 rats per group. Group 1 – Control, Group 2, 3 and 4 were administered with 1ml, 2mls and 3mls of smoothies respectively, Group 5 – Monosodium glutamate (400mg/ml), and Group 6 – Monosodium glutamate + High dose (400mg/ml +3mls of smoothies). Results from this study showed that smoothies administration in rats increase in testosterone. The study shows smoothies decreased total cholesterol below control concentrations of 3.45±0.26 mmol/L, to 3.15±0.43mmol/L, 2.90±0.06mmol/L and maximally 2.80±0.17 mmol/L at 3ml/kg dose dependently. On the contrary, MSG raised total cholesterol levels to 3.40±0.12 mmol/L, although combination treatment with high-dose smoothies reduced total cholesterol further to 2.40±0.06 mmol/L ($p<0.05$). Hence, smoothies mitigated the hypercholesterolemic effect of MSG co-treatment.

Keywords: Effect, Banana, Apple, Pineapple Sex Hormones, Cholesterol, Monosodium Glutamate

INTRODUCTION

A lot of men in the south-eastern part of Nigeria consume bread fruit both for its nutritional benefits as well as other ethnomedicinal purposes (Gbaranor, et al., 2023a). Previous study revealed that majority of the people (96.20%) preferred herbal medicine as their treatment choice and this choice of treatment by the participants could be due to the fact that herbal medicine is accessible, available, affordable and also proximity of treatment centre. Also, previous study by Gbaranor, et al., (2021) revealed that, most people in the rural areas and some in the urban areas depends on herbal medicine each time they have medical issues. Several studies have specifically linked apple consumption with a reduced risk for cancer, especially lung cancer (Feskanich, 2000). A reduced risk of cardiovascular disease has been associated with apple consumption (Sesso *et al.*, 2003). Some of the apple's protective effect against cardiovascular disease may come from its potential cholesterol-lowering ability (Aprikian *et al.*, 2002).

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Phytochemical screening showed presence of alkaloids, flavonoids, saponins and tannins in the pineapple leave extract, which components can be responsible for the observed blood glucose lowering and analgesic effects (Ajani & Opadokun, 2019). Pineapple is a rich source of vitamin C as well as other vitamins and fibre. Pineapple's bromelin stimulates digestion and the proper performance of the small intestine and kidneys; it helps in detoxification, normalizes colonic flora, helps in hemorrhoid alleviation, and prevents and corrects constipation (Ajani & Opadokun, 2019). Banana peel extract has the potential to maintain the testosterone concentration in male rats with a high-fat diet (Zulkifli *et al.*, 2020). Phytosterols present in banana also lower the cholesterol level in serum. Phytosterols consumed with food inhibit the absorption of cholesterol from the small intestine by displacing it from micelles and increasing its excretion; thereby reducing the serum LDL cholesterol levels (Thompson & Grundy, 2005). Previous study revealed the significant decrease in the serum levels of total cholesterol in the groups treated with the medium dose and the high dose (African breadfruit) when compared with the control group (Gbaranor, et al., 2024). This decreased in the serum levels of total cholesterol may be due to the presence of phytocompounds which could be responsible for this reduction and thus could use as antihyperlidemia (Gbaranor, et al., 2024). Total cholesterol serum levels that are usually increase in diabetic people could be lowered with T. africana seed extract. Thus, T. africana seed extract may be useful in preventing the development of both hyperlipidemia and atherosclerosis in diabetic people. (Gbaranor, et al., 2024). Cardiovascular disease induced by hyperglycemia is associated with alterations in serum lipid profiles (Laakso M, 1996; Steiner G, 1999; Massing et al, 2001). Alteration in serum lipid profiles are known in diabetics, which are likely to increase the risk of coronary heart disease (Laakso, 1996; Steiner, 1999; Massing et al, 2001).Study by Chattopadhyay and Bandyopadhyay, (2005) revealed that the levels of total serum cholesterol, triglycerides, total lipids, VLDL and LDL-cholesterol were reduced with Azadirachta indica leaf extract and its antihyperlipidemic effect could represent a protective mechanism against the development of atherosclerosis.

MATERIALS AND METHOD

Collection and Identification

The fruits were obtained fresh from mile 3 market in October, 2023. The fruits were identified by Dr M.G Ajuru from the department of Plant Science and Biotechnology, Faculty of Sciences, registered with the code number RSUHPb0153 for apple, RSUHPb0154 for pineapple and RSUHPb0155 for banana.

Fruit Preparation

The fruits were washed and sliced into medium sizes. 25ml of water was added. The sliced fruits were turned into the blender which was connected to an electric source. The fruits were blended for five minutes. The fruits were allowed to become smooth and was disconnected from the electric source. The smoothies were poured into the beaker and administered to the rats.

Experimental Animals and Management

Young male Wistar rats weighing 130-180g were obtained from the animal house, Faculty of Basic Medical Sciences, Rivers State University. The animals were housed in cages and maintained under natural environmental condition. These animals were fed with normal standard diets.

Study design

30 male Wistar rats were selected randomly into five rats per group. The groups include:
Group 1 – Control which was given only feed and 5mls of distilled water
Group 2 – 1ml of smoothies
Group 3 – 2mls of smoothies
Group 4 – 3mls of smoothies
Group 5 – Monosodium glutamate (400mg/ml)
Group 6 – Monosodium glutamate + High dose (400mg/ml +3mls of fruits)
Administration of fruits combination done for 14 days, and on the 15th day, the animals were weighed and sacrificed after been anesthesized in chloroform soaked with cotton wool and samples were collected.

Blood Collection

Animals were anaesthetized with Chloroform soaked in cotton wool and placed in a desiccator and 5ml of blood samples collected through cardiac puncture with syringe and shared into the plane bottles. The blood was allowed for 900 seconds and then centrifuged for 900 seconds. Thereafter, the serum was collected and transferred into another bottle and stored in a freezer for hormonal analysis.

Analysis of Sample

Blood was used for hormonal analysis as described by Bolon et al. (1997).

Statistical Analysis

Data are presented as mean ± SEM and were analysed using a one-way Analysis of Variance (ANOVA). $P < 0.05$ was declared as significant statistically

Ethical Approval

Ethical approval was approved by the Research Ethics Committee of the Faculty of Basic Medical Science in Rivers State University, Nkpolu-Oroworukwo

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RESULTS

The results shows that there was a dose-escalation effect of smoothies on testosterone, which rose step-wise from 2.49±0.12 ng/ml ($p<0.05$) to peak levels of 3.97±0.07 ng/ml at the maximum dose, non-significantly greater than control mean of 3.69±0.03 ng/ml (Figure 1). Also, MSG lowered testosterone to 2.00±0.01 ng/ml, although in addition to high-dose smoothies, it maintained moderately high testosterone concentrations of 3.44±0.14 ng/ml. In summary, smoothies non-significantly increased testosterone in a dose-responsive manner over control, partially mitigated by co-administered MSG.

Smoothies decreased total cholesterol below control concentrations of 3.45±0.26 mmol/L, to 3.15±0.43mmol/L, 2.90±0.06mmol/L and maximally 2.80±0.17 mmol/L at 3ml/kg dose dependently (Table 4.6 and Figure 2). On the contrary, MSG raised total cholesterol levels to 3.40±0.12 mmol/L, although combination treatment with high-dose smoothies reduced total cholesterol further to 2.40±0.06 mmol/L ($p<0.05$). Hence, smoothies mitigated the hypercholesterolemic effect of MSG co-treatment.

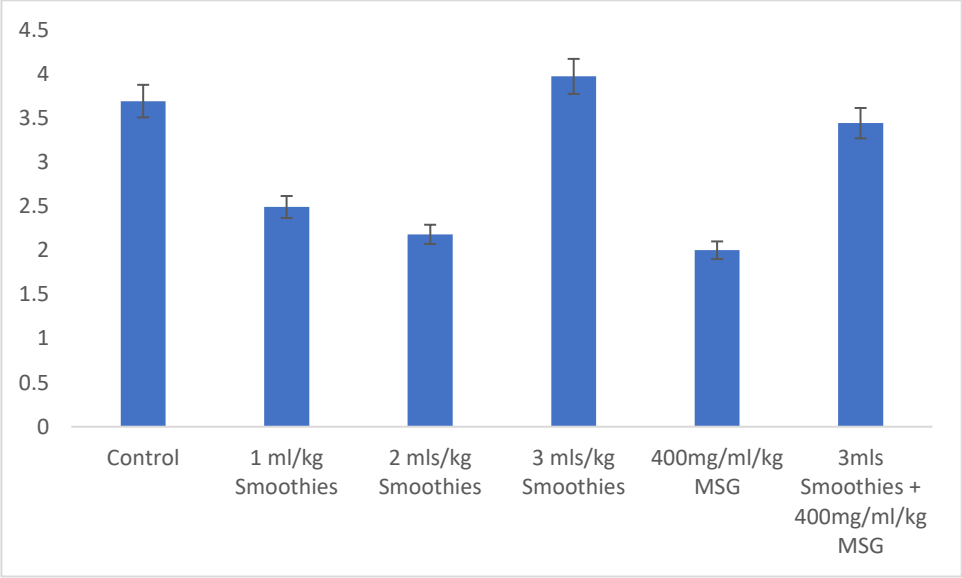

Fig. 1: The effects of smoothies on Testosterone in male Wistar rats

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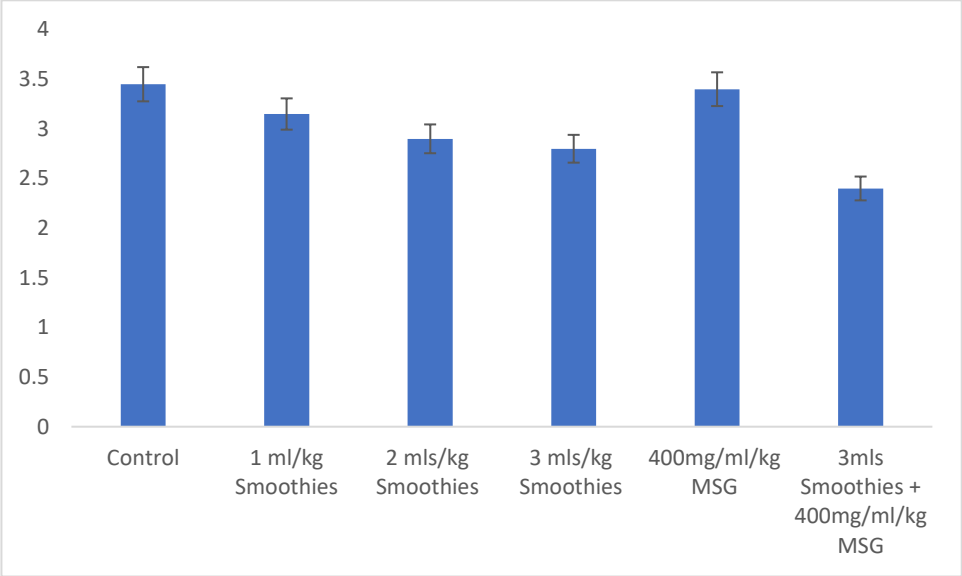

Fig. 2: The effects of smoothies on total cholesterol in male Wistar rats

DISCUSSION

The study shows that there is an increased in the serum level of testosterone in a dose-dependent manner (Figure 1). Mean testosterone rose progressively from 2.49 ± 0.12 ng/ml at the lowest dose to peak levels of 3.97 ± 0.07 ng/ml at the maximum 3 ml/kg dose ($p<0.05$ compared to control). Although not statistically significant, this represented an 8% increase over control values of 3.69 ± 0.03 ng/ml. These findings suggest the phytoestrogens in smoothies can bind testosterone receptors, leading to compensatory increases in testosterone synthesis and secretion (Taxvig et al., 2007). Monosodium glutamate (MSG) treatment alone significantly decreased testosterone to 2.00 ± 0.01 ng/ml compared to control ($p<0.05$). This present study agrees with previous studies which found that MSG administration led to significantly lower levels of GnRH, LH, testosterone, and total cholesterol (Ochiogu *et al.*, 2015; Dong & Robbins, 2015). This implies direct testicular effects of MSG or actions at the hypothalamic-pituitary level. With combined high-dose smoothies and MSG, testosterone levels remained moderately high at 3.44 ± 0.14 ng/ml.

Administration of escalating doses of smoothies led to stepwise reductions in mean total cholesterol levels compared to control values of 3.45 ± 0.26 mmol/L (Table 4.6 and Fig 4.6). Total cholesterol decreased to 3.15 ± 0.43, 2.90 ± 0.06, and 2.80 ± 0.17 mmol/L at the maximal dose of 3 ml/kg ($p<0.05$ compared to control). This implies a cholesterol-lowering effect of smoothies, likely attributable to their fiber, vegetable protein, and micronutrient content (Slavin & Lloyd, 2012). This study also agreed with previous studies by (Gbaranor, et al., 2024) and Chattopadhyay and Bandyopadhyay, (2005). were Azadirachta indica leaf extract lowered the serum levels of total cholesterol. In contrast, monosodium glutamate (MSG) treatment raised total cholesterol to 3.40 ± 0.12 mmol/L, although not significant. Similar result was observed in another study (Ochiogu et al., 2015). However, the combination of high-dose smoothies and MSG further reduced total cholesterol to 2.40 ± 0.06 mmol/L. This suggests smoothies can mitigate the adverse hypercholesterolemic effects of MSG administration

CONCLUSION

Smoothies non-significantly increased testosterone in a dose-responsive manner over control, partially mitigated by co-administered MSG. Also, the study revealed the the lowering effect of fruits on serum cholesterol level.

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Conflict of interest: No conflict of interest.

Ethical approval: It was approved by the ethical committee of Faculty of Basic Medical Sciences, Rivers State, Port Harcourt, Nigeria.

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REFERENCES

1. Ajani, R. S., & Opadokun, N. A. (2019). Unripe Rind and Pulp of Ananas comosus Accelerate Wound Healing in Diabetic Wistar Rat. *Journal of Complementary and Alternative Medical Research*, 1–13. https://doi.org/10.9734/jocamr/2019/v7i330103
2. Aprikian, O., Busserolles, J., Manach, C., Mazur, A., Morand, C., Davicco, M., Besson, C., Rayssiguier, Y., Rémésy, C., & Demigné, C. (2002). Lyophilized apple counteracts the development of hypercholesterolemia, oxidative stress, and renal dysfunction in obese zucker rats. *Journal of Nutrition*, *132*(7), 1969–1976. https://doi.org/10.1093/jn/132.7.1969
3. Chattopadhyay R.R. and Bandyopadhyay M (2005). Effect of Azadirachta indica leaf extract on serum lipid profile changes in normal and streptozotocin induced diabetic rats. African Journal of Biomedical Research, Vol. 8 (2005); 101 – 104
4. Dong, H., & Robbins, W. A. (2015). Ingestion of monosodium glutamate (MSG) in adult male rats reduces sperm count, testosterone, and disrupts testicular histology. *Nutrition Bytes*, *19*(1). https://escholarship.org/content/qt6wq9p6zn/qt6wq9p6zn.pdf?t=o2dzf4
5. Feskanich, D. (2000). Prospective study of fruit and vegetable consumption and risk of lung cancer among men and women. *Journal of the National Cancer Institute*, *92*(22), 1812–1823. https://doi.org/10.1093/jnci/92.22.1812
6. Gbaranor K. B., Ovili-Odili B. Z., Okpara E. P. Tamuno-Opubo A., Victor P. D., Orupabo C. D., Tee P. G., AlasiaO. M., Sapira-Ordu L Nonju I. I., Nwosu G. N (2021). Effect of Hydroalcohol Extract of Englerinadrummondii Balle ex Polhill & Wiens (Mistletoe).
7. Gbaranor K. B., Tamuno-Opubo A., Ekene W. E., Chris-Biriwo H., Nelson I. E., Dimkpa B. M., Modupe O., Dimkpa C., Tobin B., Amuduaghan A. E (2024). Effect of Ethanoic Extract of Treculia Africana Seeds on Total Cholesterol, Total Protein, and Nitric Oxide. Gph-International Journal of Applied Science. 07(03), 01-07
8. Gbaranor, K. B., Imarhiagbe, O. C., Ikakita Y., Robinson E. D., Dickson, I. C, Kinako, S. E., Asikimabo-Ofori S., Mube W. A., Austin-Asomeji, I., Ile V. I., Oluoha, R. U., Dimkpa C.R., Nyeche E. O (2023b). Choice of Treatment of Sexually Transmitted Infections among Males in Rural Areas of SouthSouth, Nigeria. International Journal of Medical Science and Dental Research. Vol 06, Iss 04.
9. Laakso M. (1996): Lipids and Lipoproteins as risk factors for coronary heart disease in non-insulin dependent diabetes mellitus. Ann. Med. 28, 341-345.
10. Massing M.W., Sueta C.A., Chowdhury M.., Biggs D.P., Simpson R.J. Jr.(2001) : Lipid management among coronary artery disease patients in diabetes mellitus or advanced age. American Journal of Cardiology 87: 646-664
11. Ochiogu, I. S., Ogwu, D., Uchendu, C. N., Okoye, C. N., Ihedioha, J. I., & Mbegbu, E. C. (2015). Effects of monosodium-L-glutamate administration on serum levels of reproductive hormones and cholesterol, epididymal sperm reserves and testicular histomorphology of male albino rats. *Acta Veterinaria Hungarica*, *63*(1), 125–139. https://doi.org/10.1556/avet.2015.011
12. Sesso, H. D., Gaziano, J. M., Liu, S., & Buring, J. E. (2003). Flavonoid intake and the risk of cardiovascular disease in women. *The American Journal of Clinical Nutrition*, *77*(6), 1400–1408. https://doi.org/10.1093/ajcn/77.6.1400
13. Steiner G. (1999): Risk factors for macrovascular disease in type 2 diabetes : Classic lipid abnormalities. Diabetes Care 22 (suppl. 3), C6-C9
14. Zulkifli, B., Akmal, M., Wahyuni, S., Siregar, T. N., & Gholib, G. (2020). Identification of Active Compounds of Kepok Banana Peel and the Effect on Testosterone Concentration in Male Rats with High-Fat Diet. *E3S Web of Conferences*, *151*, 01026. https://doi.org/10.1051/e3sconf/202015101026