Haemato-Biochemical Effect of Combined Ginger (Zingiber Officinale) and Garlic (Allium Sativum) in Female Wistar Rats

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ABSTRACT

BACKGROUND:Ginger and garlic are widely consumed spices in food. They have been found to have many medicinal properties incuding antioxidant, anti-inflammatory, antimicrobial, analgesic, immunity booster, anti-diabetic, regulation of blood pressure and treatment of cardiovascular diseases. The study was designed to investigate the separate and combined effects of garlic (Allium sativum) and ginger (Zingiber officinale) on haemato-biochemical parameters in Wistar rats. METHODOLOGY: Twenty (20) female wistar rats were used, the rats were divided into four groups of five rats each: Group 1: (Control); Group 2 was administered 5g/kg of ginger, Group 3 was administered 5g/kg garlic and Group 4was administered ginger 5g/kg and garlic 5g/kg.All administration was via oral route for four (4) weeks. RESULTS: The results showed a significant increased bleeding time and clotting time($p<0.05$) and decreased platelet count in group 4 administered combined doses of ginger (5g/kg) and garlic (5g/kg) extract when compared to the control group($p<0.05$) . There was a significantly increased serum AST activities in the group treated with 5g/kg of garlic only compared to that of the control ($p<0.05$) . There was a significant increase in serum ALT in the group treated with 5g/kg of garlic only ($p<0.05$) and the ginger and garlic treated group when compared to the control group ($p<0.05$).CONCLUSION: Co-administration of ginger and garlic to rats significantly increased bleeding and clotting time and decreased platelet count. There was significant change in activities of liver enzymes hence caution should be taken in consumption of combined ginger and garlic

Key Words:

INTRODUCTION

Garlic (*Allium sativum*) and ginger (*Zingiber officinale*) are widely consumed spices in food, while ginger is also consumed in drink form. Ginger was reported to show anti-inflammatory effect through the suppression of prostaglandin synthesis and also to have interference in cytokine signaling (Uz *et al.*, 2009). Ginger is a powerful antineoplastic agent. In some studies, extracts of ginger suppressed cell proliferations and also acted against resistance of cancerous cells (Nasri *et al.*, 2013). Ginger shows strong antiemetic property by enhancing intestinal motility and inhibiting serotonin receptors. Ginger was reported to stimulate the peripheral anti-cholinergic and anti-histaminic receptors and antagonize 5-hydroxytreptamine receptors in the GIT (Dugasani *et al.*, 2010).

Garlic is probably one of the earliest known medicinal plants. Over the centuries, garlic has acquired a special position in the folklore of many cultures as a formidable prophylactic and therapeutic medicinal agent(Chinedu *et al, 2019)*. Recent in vitro studies have confirmed the vasoactive ability of garlic's sulfur compounds, whereby red blood cells convert garlic's organic polysulphides into hydrogen sulphide, a known endogenous cardioprotective vascular cell-signaling molecule (Hyder *et al*.2013). Garlic may also help to prevent cognitive decline by protecting neurones from neurotoxicity and apoptosis, thereby preventing ischaemia.Many epidemiological, clinical and laboratory research studies have demonstrated that garlic has a great role in prevention of cancer, especially in relation to digestive tract cancers (Galeone *et al.*, 2006)

The assessment of haematological parameters could be used to reveal the deleterious effect of foreign compounds, toxins, chemicals and plant extracts on the blood constituents of animals. It is also used to determine possible alterations in the levels . This study investigate the effects of garlic (A. sativum) and ginger (Z. officinale) extracts in single and combined form on haemato-biochemical parameters in female Wistar rats.

Methodology

A total of twenty (20) adult male Wistar rats weighing 150-200g were used for this study. The animals were purchased from the Animal Care Unit, Department of Human Physiology, Faculty of Basic Medical Sciences, Bingham University. The animals were randomly divided into four (4) cages of five (5) rats each .

Group 1: This will serve as the control group and the animal will be given water and feed only

Group 2: This group will be administered 50mg/kg of ginger for four weeks

Group 3: This group will be administered 50mg/kg of garlic for four weeks

Group 4: This group will be administered 50mg/kg of ginger and garlic for four weeks

Bleeding time and Clothing Time was determined by the method of Duke WW (1910) and PLT count was carried out according to the method of Deciae and Lewis 1972. The activities of serum enzymes, alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (ALP) were determined spectrophotometrically, using enzymatic colometric assay kits according to the laboratory procedures of Randox Laboratories Limited kits,
United Kingdom.

RESULTS

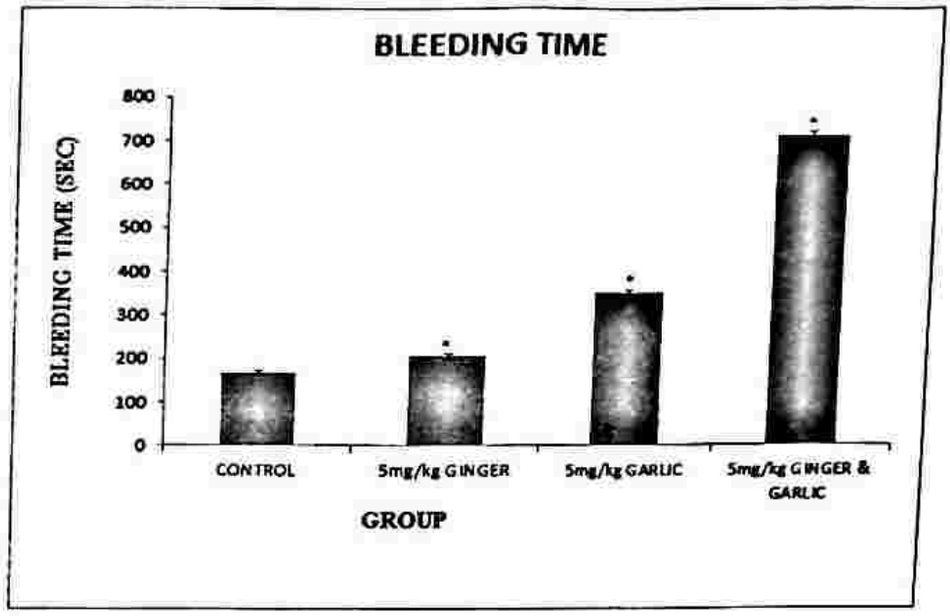
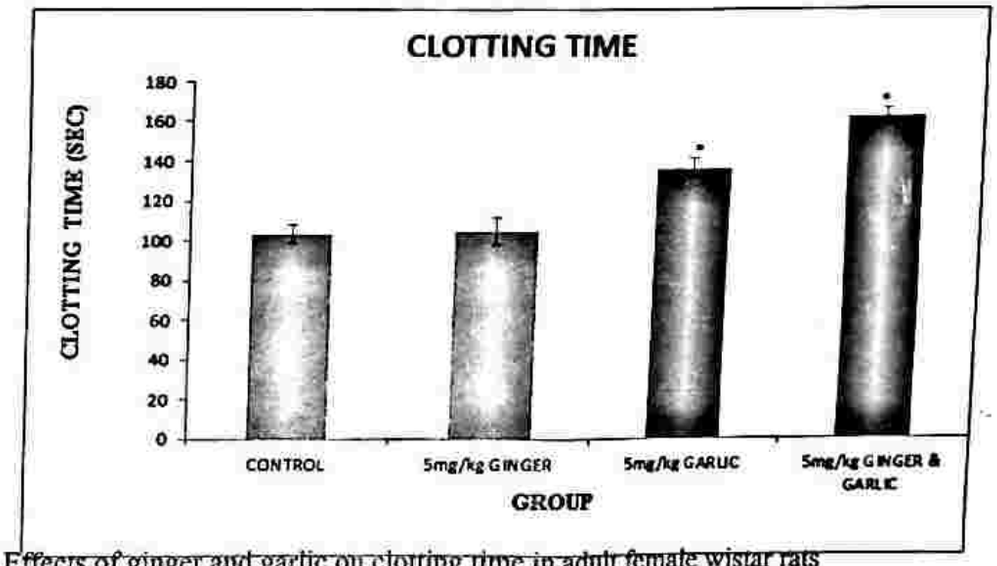


Figure.1 Effects of ginger and garlic on bleeding time in adult female wistar rats

The results showed that Bleeding Time Significantly increase in group administered 5mg/kg garlic and 5mg/kg ginger and garlic, compared to control group. However, there was no significant changes in Bleeding Time in group administered 5mg/kg ginger.

*Stands for statistical significance



Figure; 2 Effects of ginger and garlic on clotting time in adult female wistar rats

There was significant increase in Clotting Time in the group administered 5mg/kg garlic and 5mg/kg garlic and ginger. There was however no significant changes in Clotting Time in group administered 5mg/kg ginger.

*Stands for statistical significance

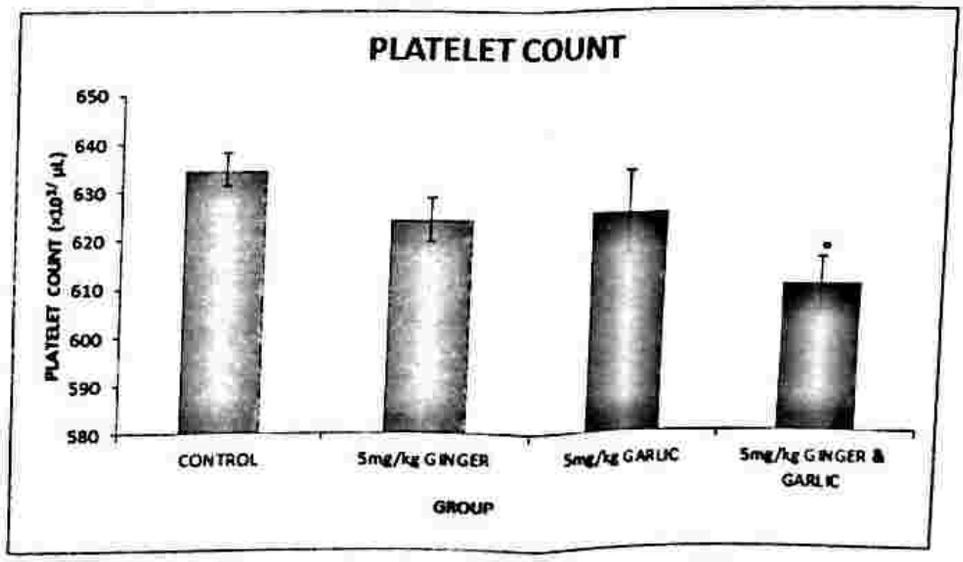


Figure.3 Effects of ginger and garlic on platelet count in adult female wistar rats
There was significant decrease in Platelet count in the group administered 5mg/kg garlic and ginger, compared to control group (P>0.05).
*Stands for statistical significance

Table 1. Effects of ginger and garlic on total bilirubin, direct bilirubin, ALP, ALT and

	TOTAL BILIRUBIN (mg/dl)	DIRECT BILUBIRIN (mg/dl)	ALP (IU/L)	ALT (IU/L)	AST (IU/L)
CONTROL	0.6±0.2	0.33±0.13	395.67±111.56	188.36±94.73	81.58±81.58
5mg/kg GINGER	0.43±0.26	0.9±0.47	114.33±114.33	166.09±166.092.	2.66±2.66
5mg/kg GARLIC	0.2±0.2	0.1±0.1	287.33±145.60	213.15±135.93	172.93±172.93
5mg/kg GINGER & GARLIC	0.3±0.3	0.17±0.17	244.00±68.79	214.86±12.93	61.76±31.97

AST.

Discussion

Exposure to extract of garlic and ginger orally for four weeks in adult female wistar rats consecutively, resulted in changes in haemostatic parameters and activities of liver enzymes.In this study, the result indicates a significant increase in the bleeding time across the treated groups. There was no significant change in clotting time in the ginger group, however there was significant increase in the garlic and combined treated groups. There was also no significant change in platelet count in the ginger and garlic treated groups respectively, however, there was a significant decrease in the combined group.

Kipyegon et al 2019, reported that the methanolic extract of Zingiber officinale possess an antiplatelet activity. High doses of Zingiber officinale significantly prolonged bleeding time in rats. The study also depicted that the extract has no statistical significant effect on platelet count which implies that Zingiber officinale inhibits function rather than formation of platelets. This result is in agreement with the study of Alhamami et al 2006. Alhamami et al 2006 reported that treatment of hyperlipidemic rats with garlic showed a significant inhibition of platelet aggregation as well as lowering of platelet count. A possible explanation for this is that garlic inhibits adenosine diphosphate (ADP), collagen, arachidonate, epinephrine, calcium ionophore as well as inhibits the formation of thromboxane, phospholipase and lipoxygenase formed in the platelets (Apitz et al 1986). Supporting evidence for this suggestion arises from the fact that allicin (one of the garlic's ingredients) inhibits platelet aggregation which in turn affects clotting time (Jamaluddin et al 1988).

The result indicates that ginger caused no significant change in the serum concentrations, ALP but caused an increase in the serum concentrations of ALT and AST. The result also indicates that the combination of ginger and garlic had no significant effect on the serum concentrations of, ALP and AST but caused an increase in ALT.
The serum concentrations of ALP, ALT and AST can serve as indicators of the state of the liver. Increased levels of ALT, and ALP are indicators of liver damage on the liver.

The study shows that the combination of ginger and garlic increases bleeding time and clotting time and decreases platelet count in rats. Caution should be taken with the use of combined ginger and garlic in individuals with haemostatic disorders.

References

Adel Grace P. Guadicos, Edgardo E. Tulin (2017). Phytochemical and Anticoagulant activity of mahogany (swietenia macrophylla) king fruit extract on rat blood. Journal of science, engineering and technology 5:44-55

Ajith TA, Aswathy MS, Hema U (2008) Protective effect of Zingiber Officinale roscoe against anticancer drug doxorubicin-induced acute Nephrotoxicity. Food and Chemical Toxicology 46(9): 3178-3181.

A Kalaiselvi, G Aadhinath Reddy, V Ramalingam (2015). Ameliorating Effect of Ginger Extract (Zingiber officinale Roscoe) on Liver Marker Enzymes, Lipid Profile in Aluminium chloride Induced Male Rats. International Journal of Pharmaceutical Sciences and Drug Research, 7(1):52-58

Alamgeer, Quarat ul Ain, Umme Habiba Hasan, Hira Asif (2018). Antithrombic activity of mentha lonfifola in animal model. Journal of the Bangladesh pharmacological society 13:67-73

Andrews RK, Berndt MC (2004). Platelet physiology and thrombosis. Thrombosis Research 114(5-6):447-453.

Aurora Garcia-Manzano, Jose Gonzalez-Llaven, Christina Lemini, Consuelo Rubio-poo (2001).

Standardization of rat blood clotting tests with reagents used for humans. Proceedings of the Western Pharmacology Society 44:153-155.

Banerjee SK, Maulik M, Manchanda SC, Dinda AK, Das TK, Maulik SK. (2001). Garlic-induced alteration in rat liver and kidney Morphology and associated changes in endogenous antioxidant status. Food Chemical Toxicology 39: 793-7.

Chinedu I, Jivini S Z. (2019). Medicinal Properties of Ginger and Garlic: A Review. Current Trends in Biomedical Engineering & Biosciences 18(2): 555985.

Clemetson KJ (2012). Platelets and primary haemostasis. Thrombosis Research 129 (3):220-224.

Dejana E, Callioni A, Quintana A, de Gaetano G (1979). Bleeding time In laboratory animals. II-A comparison of different assay Conditions in rats. Thrombosis Research 15: 191-97.

Dugasani S, Pichika MR, Nadarajah VD, Balijepalli MK, Tandra S, et al. (2010) Comparative antioxidant and anti-inflammatory effects of [6]-gingerol, [8]-gingerol, [10]-gingerol and [6]-shogaol. J Ethnopharmacol 127(2): 515-520.

Duke WW (1910). The relation of blood platelets to hemorrhagic disease. Description of a method for determining the bleeding time and the coagulation time and report of three cases of hemorrhagic disease relieved by blood transfusion. Journal of the American Medical Association.55:1185–1192.

D.V.Dapper, P.N. Achinike, M.D. Gwotmut (2007). The effects of aloe vera gel on clotting time, prothrombin time and plasma fibrinogen in albino wistar rats. Port Harcourt Medical Journal, 2:56-60.

Eidi A, Eidi M, Esmaeili E (2006) Antidiabetic effect of garlic (Allium Sativum L.) in normal and streptozot ocin-induced diabetic rats. Phytomedicine 13(9): 624-629.

Fikry Ali Abushofa, Azab Elsayed Azab, Nadia Kermani, Tahani S. AL-Jelany Sakah (20 Hepatoprotective Effect of Garlic Aqueous Ex against Hepatotoxicity Induced By Ciprofibrate Male Albino Rats. Journal of biotechnology bioengineering, 4(1):1-13

Fukao H, Yoshida H, Tazawa YI, Hada T (20C Antithrombotic Effects of Odorless Garlic Powder b in vitro and in vivo. Bioscience, Biotechnology a Biochemistry 7:21.

Galeone C, Pelucchi C, Levi F, Negri E, Franceschi S, al. (2006) Onion And garlic use and human cance American Journal of Clinical Nutrition 84(5): 102 1032.

Gebreselema Gebreyohannes and Mebraht Gebreyohannes (2013). Medicinal values of Garlic International Journal of Medicine and Medica Sciences 5(9); 401-408

Harris, J. C. et al. (2001). Antimicrobial Properties of Allium sativum (garlic)', Applied Microbiology and biotechnology. Springer, 57(3); 282–286.

Hosseini, A. and Hosseinzadeh, H. (2015) 'A Review on the effects of Allium sativum (Garlic) in metabolic syndrome', Journal of Endocrinological Investigation. Springer, 38(11);1147–1157.

Hyder, M. A., Hasan, M. and Mohieldein, A. H. (2013) 'Comparative levels of ALT, AST, ALP and GGT in liver associated diseases', European journal of experimental biology, 3(2); 280–284.

Jalal Bayati Zadeh and Nasroallah Moradi Kor (2014). Physiological and pharmaceutical effects of Ginger (Zingiber officinale Roscoe) as a valuable medicinal plant. European Journal of Experimental Biology, 4(1):87-90

Jayakumar SM, Nalini N, Venugopal M.(1999). Antioxidant activity of ginger (Zingiber officinale Roscoe.) in rats fed a high fat diet. Medical Science Research 27: 341-344.

Jude Ogechukwu Okoye, Anthony Ajuluchukwu Ngokewe and Chizoba Okechukwu Okeke (2014).

Biochemical, haematological and histological effects following escravos crude oil ingestion by chinchilla rabbits. International journal of medicine and medical sciences 16:63-68

Kikuzaki H, Nakatani N. (1993). Antioxidant effect of some Ginger constituents, Journal of Food Science 58(6): 1407-1410.