

**HISTOLOGICAL EFFECT OF THE LIVER FOLLOWING THE
ADMINISTRATION OF ETHANOLIC ROOT EXTRACT OF ZINGIBER
OFFICINALE (GINGER) IN MALE RATTUS NORVEGICUS.**

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ABSTRACT: *Zingiber officinale* is one of the most widely used spices in the world for food additives. It contains zingiberone, shogaols, gingerols, pandols, β -phellandrene, curcumene, cineole, geranyl acetate, terpineol, terpenes, borneol, geraniol, limonene, β -elemene, zingiberol, linalool, α -zingiberene, β -sesquiphellandrene, β -bisabolene, zingiberenol and α -farnesene. It is one of the medicinal herbs used to treat several ailments such as cold, headache, nausea, stomach upset, diarrhoea digestive, gastrointestinal disturbances, rheumatic complains, asthma and parasitic infections. The liver is the largest viscera in the body and performs several functions such as removal of waste product and worn out cells from the blood, converting drugs into forms that can be eliminated easily etc. Liver functions can be hindered by numerous substances such as medicinal herbs ingested on daily bases. This study aimed at elucidating the cytoarchitectural distortion of the liver following the administration of ethanolic root extract of ginger using ratus norvegicus. 35 ratus norvegicus weighing 125-200g were divided into five groups designated A, B, C, D & E. A & B were the control groups and the experimental groups C, D & E received 100mg/kg, 250mg/kg & 500mg/kg of ethanolic root extract of ginger respectively for fourteen days. The results showed constricted sinusoids, constriction of central veins and pyknotic cell nuclei. The above result showed that ethanolic root extract of ginger could distort the liver cells and this is attributed to prolonged administration and dose dependent.

KEYWORDS: ginger, liver, ratus norvegicus

INTRODUCTION

About 70-80% of the world population depend on unconventional medicine for their primary health care (Akerele 1993) and ginger is one of herbal plants that are used traditionally to treat different kinds of ailment. Ginger is a rhizome of monocotyledonous perennial plants that reaches the height of 2 feet and has greenish yellow flowers. It is used for food additives and traditionally, for treating several ailments such as pain, rheumatism, bronchitis (Afzel et al 2001). It has antibacterial (Mahady et al 2003, Azu et al 2007), analgesic and anti-inflammatory (Raji et al 2002; Grzanna et al 2005) antidiogenesis and antitumour activities (Surn et al 1999; Kim et al 2005). It also has antiulcerogenic activity (Agrawal et al 2000; Moshen et al 2006). *Zingiber officinale* contain zingerone, shogaols, gingerols, pandols, β -phellandrene, curcumene, cineole, geranyl acetate, terpineol, terpenes, borneol, geraniol, limonene, β -elemene, zingiberol, linalool, α -zingiberene, β -sesquiphellandrene, β -bisabolene, zingiberenol and α -farnesene (Baliga et al 2011, 2012, Chribasik et al 2005, Ali et al 2008, Palatty et al 2013, Haniadka et al 2012, 2013).

Liver is the largest viscera in the body weighing about 1.36kg. It is located in the right upper quadrant of the abdomen tucked against the inferior surface of the diaphragm (Seeley et al 2008). Microscopically, the liver is filled with tiny cylinders called hepatic lobules. Each lobule contains a central vein passing down its core surrounded by radiating sheets of cuboidal cells called hepatocytes. Each plate of hepatocyte contains one or two cell thick of epithelium. The spaces between the plates of hepatocytes are blood-filled channels called hepatic sinusoids lined by fenestrated endothelium that separate the hepatocytes from the blood stream but allow blood plasma into spaces between the hepatocytes and endothelium. The sinusoids also contain phagocytic cells called Kupffer cells which remove bacteria and debris from blood. Blood filtering via the sinusoids comes directly from the intestine. Liver remove glucose, amino acids, irons, vitamins and other nutrient from food after meal for metabolism or storage. It also removes and degrades hormones, toxins, bile pigments and drugs. It secrete albumin, lipoproteins, clotting factors, angiotensinogen and other products into the blood. It breaks down stored glycogen into circulation (Kenneth et al 2004). Destruction of the liver cells could hinder the functions of the liver thereby causing toxic substance from intestine such as drugs to enter the circulation. Therefore our study was carried out to elucidate the histology of the liver following the administration of ethanolic root extract of ginger using *rattus norvegicus*.

MATERIALS AND METHODS

Thirty five adult *rattus norvegicus* weighing 125-200g were randomly divided into five groups designated A, B, C, D and E. Each of the group contain seven rats; group A served as normal control and fed with rat chow and water only, group B served as the vehicle control and was given 2mls of olive oil daily. The experimental groups C, D and E received 100mg/kg, 250mg/kg and 500mg/kg of ethanolic root extract of ginger respectively for fourteen days. Twenty four hours after the last administration, the animals were sacrificed; liver removed and fixed in Bouin's fluid for twenty four hours to harden the tissue. Following fixation, the liver was processed in routine histological procedure, stained with Haematoxylin/ Eosin (H&E) stains and viewed under light microscope.

RESULTS

The control group A showed a preserved cytoarchitecture with a well outline central vein (CV) with hepatocytes (HC) radiating outward from it. Group B is the vehicle control received 2mls of olive oil daily showed preserved architecture with outlined CV and plates of HC radiating outwards like spokes of a wheel. The sinusoidal spaces (SS) are well demonstrated. The interlobular spaces contain the portal triad (PT) consisting of bile duct (BD), hepatic artery (HA) and the portal vein (PV). The experimental group C received 100mg/kg of ethanolic root extract of ginger showed normal cytoarchitecture of the liver with constricted sinusoidal spaces. Group D that received 250mg/kg showed mild constriction of CV and SS. Group E that received 500mg/kg showed constriction of SS, CV and detached HC due to the distortion of the endothelial cells of the sinusoids (S) and of the HC in the perivascular area. Some nuclei are pyknotic.

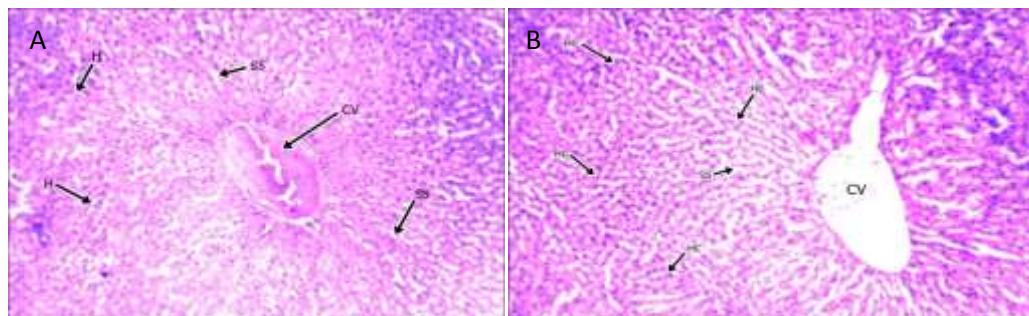


Plate A & B: sections of the liver showing preserved cytoarchitecture with a well outlined CV, HC radiating from CV.

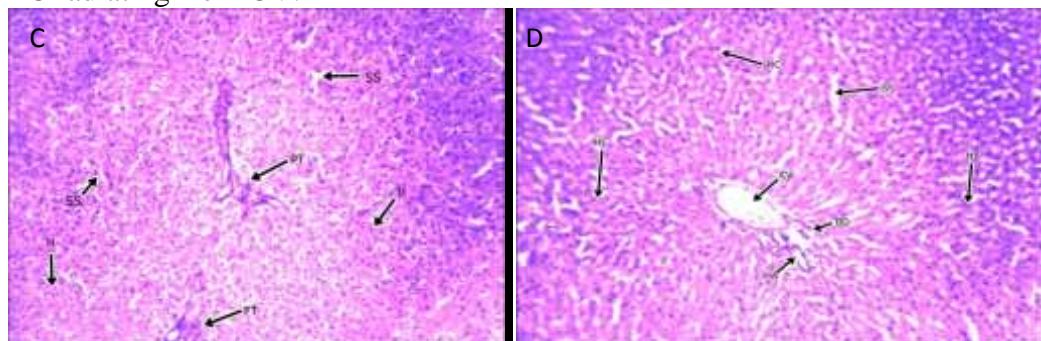


Plate C: section of the liver with constricted SS. **D** showed mild constricted SS and CV

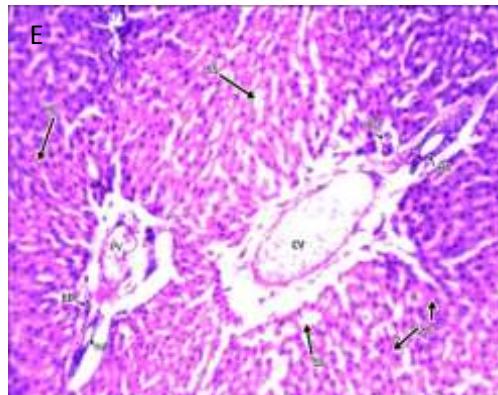


Plate E: showing constricted SS and pyknotic nuclei.

DISCUSSION

Herbs have been widely used therapeutically to provide treatment and prevention of diseases in mammals (Weiss 2000). However, the adverse effects of herbal drugs are less when the drugs are used properly. Side effects could be intrinsic relating to predictable toxicity, over-dosage and interaction with conventional drugs and extrinsic relating to manufacturing problems such as misidentification of plants, lack of standardization, failure of good manufacturing practice, contamination, substitution/ or dosage (Farnsworth et al 1993 & Drew et al 1997) and ginger is one of such herbs used to treat and prevent several ailments such as arthritis, colic diarrhoea, headache etc. it is widely used as spice in the world for food additives and contain zingerone, shogaols, gingerols, pandols, β -phellandrene, curcumene, cineole, geranylacetate, terpineol, terpenes, borneol, geraniol, limonene, β -elemene, zingiberol, linalool, α zingiberene, β sesquiphellandrene, β -bisabolene, zingibenol & α -farnesene (Baliga et al 2011, 2012, Chrubasik et al 2005; Ali et al 2008; Palatty et al 2013; Haruadka et al 2012 & Haniadka et al 2013). Study suggested that aqueous extract of ginger cause no microscopic

changes on the stomach of adult wistar rats (Eru et al 2014), Mowrey and co-workers in 1982 suggested that ginger aids digestion, absorption, relieve constipation and flatulence in GIT by increasing the activity of the smooth muscle and also reduce nausea and vomiting significantly. Some studies have showed that feeding rats with diet containing ginger has a protective agent against carbontetrachloride-induced liver damage (Patrick et al 2007); reduces lindane-induced hepatotoxicity by enhancing the levels of reactive oxygen species-scavenging enzymes and glutathione and decreasing the levels of the lindane-induced lipid peroxidation (Ahmed et al 2008), it also prevent hepatotoxic effect of lead (Khaki et al 2010) cadmium (Eteng et al 2012) and mercury (Vitalis et al 2007). The liver cells remove glucose, amino acids, irons, vitamins and other nutrients from food after meal for metabolism or storage. It also removes and degrades hormones, toxins, bile pigment and drugs (Kenneth et al 2004), destruction of liver cells could hinder its functions and allow toxic substances to enter blood circulations.

Therefore this study aimed at elucidating cytoarchitectural distortion of the liver tissues following administration of ethanolic root extract of ginger using adult wistar rats. After fourteen days administration of ethanolic root extract of ginger, routine tissue processing was carried out, the liver section was viewed under light microscope. The result showed preserved cytoarchitecture in the control groups (plate A & B). The experimental group C showed mild constricted SS (plate C), group D showed mild constriction of CV and dilatation of SS (plate D), group E showed constriction of CV, constriction of SS and detached HC due to distortion of the endothelial cells and some nuclei were pyknotic (plate E). The liver functions could be hindered with numerous substance ingested on daily bases; these include medicinal agents taken overdose that could damage the liver cells (Gaglino et al 2007) such as ethanolic extract of ginger and the level of distortion could be attributed to prolonged administration of this extract.

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