

GINGER (*ZINGIBER OFFICINALE ROSCOE*) SUPPRESSES OBESITY AND INFLAMMATION IN FAT INDUCED WISTAR ALBINO RATSQurat ul Ain¹, Farheen Shaikh², Tabinda Taqi³, Noor ul Ain⁴, Rida e Zenab⁵, Mumtaz Solangi⁶.**ABSTRACT**

Objectives: To determine and compared the impact of ginger on mucosa of small intestine of normal and obese Wistar albino rats. **Methodology:** This animal study was conducted at the Anatomy department of PUMHSW, Nawabshah with collaboration of department of Animal Resource Center of SAU (AHVS-SA), Tando Jam. The duration of study was 6 months from January to June 2018. Total Sixty (60) healthy male adult Wistar Albino rats (WARs) with body weight (BW) of 180.0 – 220.0 gm were selected. Rats were taken from the AHVS-SA Tando Jam. The WARs were divided into 3-groups; 20 rats were in each group. Control group WARs were fed a normal diet, Group-B HF-diet provoked group and Group- C Ginger treated group of rich fatty diet. Animals were sacrifice as study was completed and pieces of the small intestine and were fixed in 10.0% formalin for 24 hours, and embedded in paraffin. Findings of all group animals were recorded. A pre-designed proforma was used for the collection and documentation of data during research. SPSS 22.0 was used to analyse data.

Results: In present study we found significant difference declined in the body weight of WARs after consumption of ginger among groups ($p < 0.001$). whereas histomorphological picture is slight different in HFD group and experimental group as compared to normal architecture of mucosa of small intestine ($p < 0.05$). The very slightly inflammation was observed in small intestinal mucosa in HFD group as compared to control but the mucosa of small intestine of ginger consumption group almost normal ($p < 0.05$). **Conclusion:** The present study concluded that ginger plays an antioxidant role on inflammation and mucosa of small intestine in obese WARs as compare to normal healthy WARs.

Keywords: Ginger, High fatty diet, Small intestine

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INTRODUCTION

Ginger (*Zingiber officinale* Roscoe), has been commonly used spice and as herbal medicine since long years¹. Ginger is used to treat some common diseases, such as cold, emesis, nausea and headache². Ginger contain many bioactive phenolic compounds, which are mainly gingerols, shogaols, and paradols.³ These bioactive compounds act as an anti-inflammatory, antioxidant and antimicrobial agents.⁴ It is also used as to prevent the obesity, Type-II diabetes mellitus respiratory disorder.⁵ The ginger was effective for protection against oxidative stress, which is mediated by interleukin-1 β .⁶ It stimulates the gene expressions for several antioxidant enzymes and reduced the generation of ROS and lipid peroxidation.⁷ ulcerative colitis is inflammatory bowel disease promoted by the abnormal immune reaction of the pathogens in the cell and

intestinal flora results in an inflammation of digestive tract.^{8,9} Several studies have revealed in an animal model that ginger constituents having beneficial effects in digestion, absorption, relieve constipation and flatulence in the GIT by increasing the activity of the smooth muscle and lessen nausea and vomiting.¹⁰ The inflammation is mediated by prostaglandin, cytokines or interleukins. These inflammatory markers are synthesized by eicosanoids stimulation, which is caused by phospholipases A2 activity.^{11,12} Gingerol or shogaol bioactive agents of ginger inhibit prostaglandin and leukotriene biosynthesis through suppression of arachidonic acid synthesis.¹³ In present study, we elucidate and compared the effect of ginger on small intestinal mucosa and histomorphological changes among normal, HFD Wistar albino and ginger consume group.

Objectives: To determine and compared the

impact of ginger on mucosa of small intestine of normal and induced inflammation in Wistar albino rats.

MATERIALS AND METHODS:

A experimental study was conducted at the Department of Animal Husbandry and Veterinary Sciences Sindh Agriculture University Tando Jam and the Anatomy department of Peoples University of Medical and Health Sciences for Women (PUMHSW) Nawabshah, SBA. The duration of study was six (6) months from January to June 2018. The 60 Male Wistar Albino rats with body weight (BW) of 170-220 gms were selected, whereas females Wistar Albino rats and BW <170 gm or >220gm were excluded from the study. Present study was performed after approval by the ethical Committee, PUMHSW, SBA. Rats were acquired from the Animal Resource Center of SAU Tando jam. After the approval from ECR of PUMHSW, experiments were carried out on adult male WARs. Six animals per cage were housed in a temperature-controlled room (22± 2°C) and humidity (55%±5%), and a 12-hours circadian rhythm. The animals were on proposed food & water ad libitum. The selected animals for present study were divided into three groups as: Group A (n=20): served as a Control group, Group B (n=20): Inflammation provoked by DSS group and Group C (n=20): Ginger treated group. Findings of all group animals were

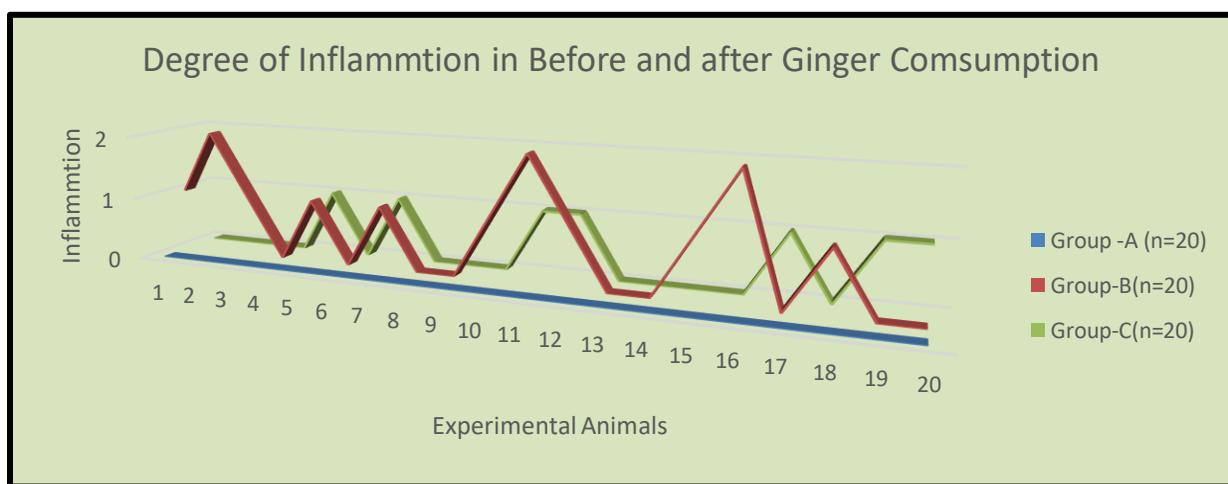
recorded. A pre-designed proforma was used for the collection and documentation of data during research. SPSS 22.0 was used to analyse data. ANOVA (Tuckey) test was applied and results were shown as mean and standard deviation.

The Diet Composition of normal control rats: 50 % carbohydrates,33% Fat, 10% protein, 3.5% mineral mixture, 1 % vitamin mixture, 1.5% methionine and 1 % fiber.¹⁴

RESULTS:

According to histological morphology, all animals of Group-A were normal, whereas HFD groups was showing mild inflammation of mucosa of small intestine, but experimental groups mucosa has almost shown no any inflammation. Findings were statistically significant and shown in Graph -1 and in Figure 1. The degree of inflammation was graded as **Mild (+1)**, Minor infiltration in the submucosa, presence of goblet cells, and slight elongation of the crypts **whereas** large infiltration of leukocytes in the mucosa and submucosal was considered as **Moderate (+2)**, and infiltration of leukocytes in the muscular layer, disruption of cell lining and absence of goblet cell or payer patches considered as **Severe (+3)**.infiltration of leukocytes in the muscular layer, submucosa, and mucosa, and no goblet or payer patches were seen and disruption of cell lining. But our study shows no severe inflammation as shown in Table-1.

Table -1 Frequency of Distribution of Inflammation in Experimental Animals Before and afterGinger Consumption				
Degree of Inflammation	Experimental Animal (n=60)	Frequency (%)	Mean ±Std	P value
No any Inflammation	38	63.3		
Mild	14	23.3	1.53±0.81	<0.03
Moderate	6	10.0		
Severe	2	3.3		



Graph -1 Degree of Inflammation in Experimental Animals Before and after Ginger Consumption



Figure-1: Mononuclear Infiltrate (MNI) and Vascular Congestion in the mucosa of Small Intestine of the (a) and (b) Induce HFD Group of Wistar Albino Rat (40x).

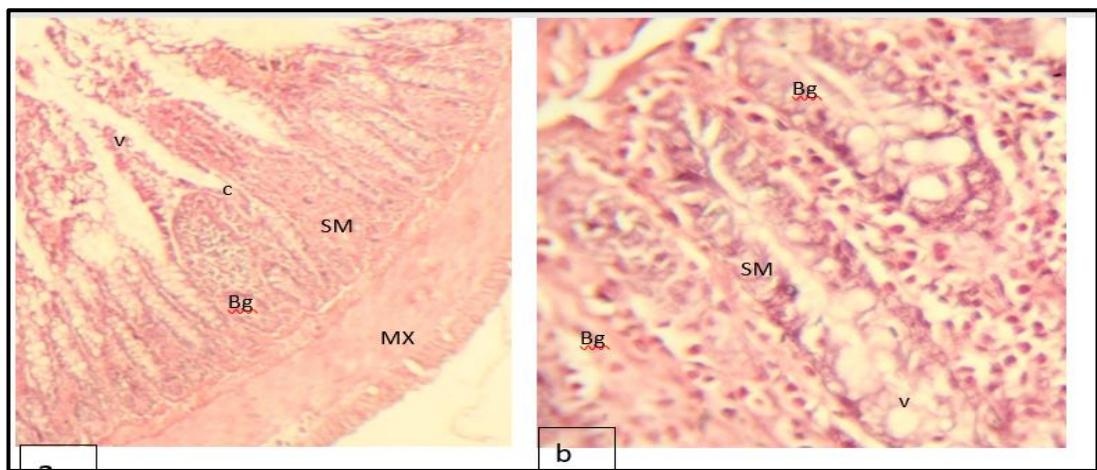


Figure-2 Effects of Ginger on Small Intestine After Consumption of Ginger in WAR (a)-Subside Monoinfiltration in HFD-Group (b)- Experimental Group

DISCUSSION

The present study results showed that HFD-induced intestinal inflammation, but the ginger relief the local and systematic inflammation. Duan Y *et al.*,¹⁵ revealed by their experiment on murine and revealed that HFD is a causative factors of many diseases. Gruber L *et al.*,¹⁶ and Dinh CH *et al.*,¹⁷ revealed that HFD-induced obesity and associated consequences such as increased cytokine and adipokine levels which causes inflammation. Our study results have similar observations with above mentioned study on mouse model that HFD enhance the body weight and also causes inflammation of mucosa of small intestine.

Al Hroob AM *et al.*,¹⁸ reported that ginger has beneficial effects on small intestine and help in reduction of inflammation not only mucosa of small intestine but also effects on other tissues, present study result was showing that after consumption of ginger the inflammation is reduced.

Kims *et al.*,¹⁹ reported that ginger extract reduced body weight and reduced size of adipocytes, our results consistent with previous studies.

Habib *et al.*²⁰ reported that ginger extract can lessen the gene expression for the synthesis of NFκB and TNF-α in rats with liver cancer. But our study on HFD and we found beneficial effects inflamed mucosa of intestine ginger. Lantz *et al.*²¹ revealed that gingerols can inhibit lipooxygenase pathway and shogaol inhibit

cyclooxygenase pathway and inhibit inflammation. These data demonstrate that important compounds in ginger are capable of inhibiting the prostaglandin production and we found similar finding in our present study.

CONCLUSION

The present study concluded that ginger consumption had a significant impact on the reduction of body weight in HFD WARs and also beneficial effects on intestinal mucosa and reduced inflammation.

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