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Pharmacological effect of Panax ginseng against oxidative stress that induced by shigella in rats

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Abstract

The current study aimed to show the Pharmacological effect of Panax ginseng against oxidative stress that induced by shigella in rats. 24 rats (wt 200-250 gm with age4-6 month) were used in current work and divide as follow; Control group: male rats received standard diet. Infected group: administrated with 1 x 10^9 S. flexneri. Root extract group: administrated with root extract 150mg/kg for month. Treated group: administrated with 1 x 10^9 S. flexneri and treated with root extract 150mg/kg for month.The results demonstrated significant (P < 0.05) increased in levels of malondialdehyde (MDA) with significant (P < 0.05) decreased in levels of glutathione (GSH) and catalase in an infected group compared with control group. The findings of Root extract group and treated group demonstrated non-significant (P < 0.05) difference in oxidative status compare with control group when using C. azarolus extract. It was concluded from present study that Panax ginseng extract has been role against S. flexneri.

Keywords: Panax ginseng; S. flexneri;oxidative status; antioxidants.

Introduction

Panax ginseng (family: Araliaceae), is a perennial herbaceous and half-shaped plant is traditionally used as an important herbal medicine in East Asian medicine for centuries [1-2]. A lot of research has focused on individual ginsenosides instead of whole ginseng against many disease conditions [3-8]; among these ginsenosides, Rb1, Rg1, Rg3, Re, and Rd are most often studied [8]. Cardiovascular disease is the major cause of morbidity and mortality and includes various diseases such as vascular disease, heart failure, coronary artery disease, cardiac ischemia, and hypertension [9]. Cardiac risk factors, such as cigarette smoking, increased low-density lipoprotein cholesterol, decreased level of high-density lipoprotein cholesterol, diabetes, and hypertension, are the main causes of cardiovascular disease [10]. Many researchers have shown that inflammation of blood vessels can result in atherosclerosis and

coronary artery dysfunction [11]. Endothelial injury of blood vessels can be initiated by dangerous factors involved in cardiovascular disease [12].Shigella sp. is a Gram-negative bacterium; a facultative anaerobic bacterium belongs to the family Enterobacteriaceae and is considered an etiological agent of shigellosis or bacillary dysentery [13-14]. Infection with Shigella causes bacillary dysentery and has been recognized as a major cause of inflammatory diarrhoeal disease in endemic regions. The low infective dose and faecal–oral route of transmission facilitates spread through contaminated food and water and personal contact. Shigellainfections remain problematical for young children in endemic regions, travellers and deployed military personne [15-16].

Materials & methods

Animal model

In current work 24 rats, (wt 200-250 gm with age4-6 month) obtained from Science College/ Tikrit University. The study was done in laboratories of University of Samarra, Iraq.

Shigella isolates

Shigella isolates were obtained from Kirkuk University/ college of science/ department of biology.

Preparation of the Extract

The roots of Panax ginseng were collected from Tikrit market, cut into small pieces. The dried roots (by oven) were then grinded to obtain a fine powder. The powder was again dried by using oven and was ready for use. The grinded powder was then extracted with 1000ml double distilled water containing 3-4 drops of chloroform for 48h. The extract was then concentrated at temperature less than 45°C.The residue was then dried and refrigerated [17-18]. The extract was orally used at a concentration (150mg) as a single dose per day.

Experimental design

24 rats (male) were used in current study and then distributed as follow (six rats in each group):

- **A.** Control group: male rats received standard diet only for seven days and then killed.
- **B.** Infected group: administrated with 1 x 10^9 S. flexneri.
- **C.** Root extract group: administrated with root extract 150mg/kg for month.
- **D.** Treated group: administrated with 1 x 10^9 S. flexneriand treated with root extract 150mg/kg for month.

Measurements

MDA was measured according to reaction of colorimetric with thiobarbituric acid (TBA) using spectrophotometer device [19]. GSH measured by mixed buffer (2.3 ml)

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with of serum (0.2ml) and then added 0.5ml of compound called 5,5-dithio-bis-(2-nitrobenzoic acid) (DTNB). The mixture of compounds and serum was analyzed by device of spectrophotometer [20].

Statistical analysis

Current data were analyzed by using program known as Minitab (statistical program). A statistical change between the groups means were analyzed using one-way analysis of variance.

Results

The levels of MDA show significant increased ($P<0.05$) in an infected group (2.07±0.24) compare with control group (1.28±0.31). After treatment, third and fourth groups (1.41±0.13; 1.28±0.65 respectively) show non-significant changes compare with control group as shown in figure (1). The levels of GSH and catalase show significant decreased ($P<0.05$) in an infected group (0.217±0.026; 0.81±0.07 respectively) compare with control group (0.352±0.034; 1.53±0.19 respectively). After treatment, third (0.336±0.017; 1.42±0.1 respectively) and fourth (0.369±0.04; 1.49±0.95 respectively) groups show non-significant changes compare with control group as shown in figure (2& 3).

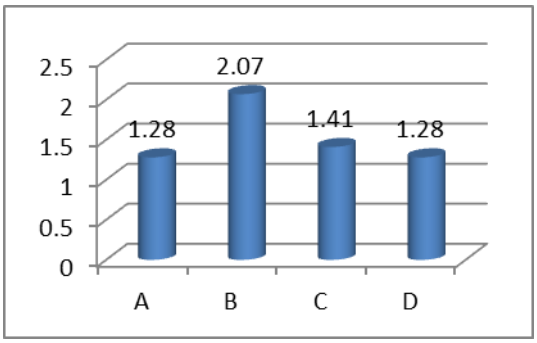

Figure (1): MDA (nm/L) levels in all groups

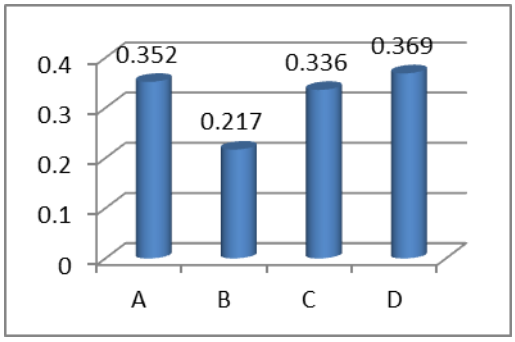

Figure (2): GSH (nm/L) levels in all groups

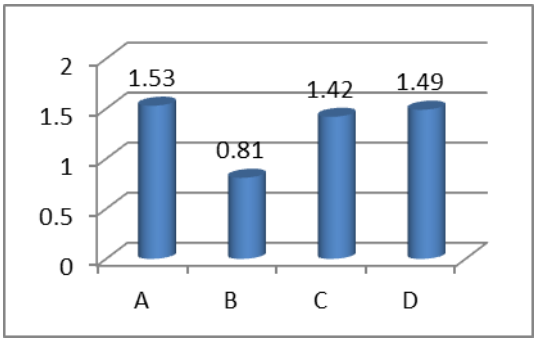

Figure (3): catalase (nm/L) levels in all groups

Discussion

Shigella infection is characterized by a pronounced pro-inflammatory response that causes intense stress in host tissues, particularly the intestinal epithelium, which constitutes the first barrier against *Shigella* colonization [21]. Multiple animal models of shigellosis have been established. Rabbani et al [22] infected the rabbit intestine with Shigella using the ligated ileal loop assay and found that it caused inflammation within the colon. Fernandez et al [23] established a mouse model of shigellosis by orally infecting four-day-old mice with Shigella and found similar pathological changes to those of human bacterial dysentery and inflammation. Martino et al [24] provided a streptomycin-treated murine model in which Shigella are able to reach their natural tissue target: colon. Shim et al [25] established a guinea pig model by inoculating S. flexneri 2a or 5a in the rectum. Jeong et al [26] established a piglet model of acute gastroenteritis with Shigella type I and found that piglets are highly sensitive to Shigella and demonstrate clinical signs such as acute diarrhea, anorexia, and dehydration. Barman et al [27] established a shigellosis in the guinea-pig model infected with Shigelladysenteriae into the cecocolic junction after ligation of the distal cecum without any preparatory treatment, which induced acute inflammation. Yang et al [28] established an adult mice model of Shigellosis by intraperitoneal infection. This study showed that Shigella lead to oxidative stress in rats and decrease in antioxidant enzymes. [29]

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