

**International Journal of Biology, Pharmacy  
and Allied Sciences (IJBPAS)**

*'A Bridge Between Laboratory and Reader'*

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**EFFECT OF TURNIP ROOT EXTRACT ON LIVER ENZYME CHANGES IN RATS  
UNDERGOING CHEMOTHERAPY WITH CYCLOPHOSPHAMIDE**

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**ABSTRACT**

Cyclophosphamide is a drug with alkylating properties that inhibits DNA synthesis. DNA synthesis is inhibited with it. The use of herbal antioxidants to reduce the side effects of chemical drugs is recommended. The antioxidant property of turnip is proven. The purpose of this study was to investigate the effect of turnip root extract on liver enzyme changes in rats undergoing chemotherapy with cyclophosphamide.

42 adult wistar rats were selected and divided into 6 groups. Group C without receiving any medication. Group S saline solution, group T250 turnip extract 250mg/kg B.W, group C5 cyclophosphamide 5mg/kg B.W, group CT125 cyclophosphamide 5mg/kg B.W with turnip extract 125mg/kg B.W and group CT250 cyclophosphamide 5mg/kg B.W with turnip extract 250mg/kg B.W intra-peritoneally received.

At the end of the experiment, rats were anesthetized, blood was drawn from their heart and the enzyme activities of ALT, AST and ALP were measured.

Enzyme activities of ALT, AST and ALP in group T250 were no significant changes than Group C. The enzyme activity in group C5 was a significant increase than Group C. In groups CT125 and CT250 which received cyclophosphamide plus turnip extract, enzyme activities were reduced than group C5. There was dose proportional relative improvement in them.

The present study showed that Turnip extract may improve hepatic status. It also causes reducing the effects of cyclophosphamide; it makes close enzymes in normal level in serum. The turnip

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has antioxidant property that reduces the damaging effects of cyclophosphamide are dose-dependent manner.

**Keywords: Turnip, Cyclophosphamide, Liver enzymes, Rat**

## INTRODUCTION

Liver Cancer or Hepatocellular Carcinoma (HCC) is one of the most common cancers in the world. Chronic infection with hepatitis B virus HBV (B) is one of the main causes of liver cancer [1]. Cyclophosphamide is anti-cancer drug which are used in chemotherapy. This drug is an alkylating and the connection between the two strands of DNA and RNA and protein synthesis inhibition and is breaking it [2]. Considering that cancer is unbridled cell proliferation, so cyclophosphamide through inhibition of cell proliferation acts [3-4]. Cyclophosphamide is Induce apoptosis in cancer cells, embryonic cells, lung cells, and cells of the rat thymus [5-9]. Although this drug has anti-cancer properties is well and is a reduction in tumor volume but high doses, weakens the immune system. This weakness is usually induced immunologic responses, develop opportunistic infections and cancers are caused again [10-11]. So one of the mechanisms by which cell death is defined to cyclophosphamide. However, cell death induced by the cyclophosphamide programmed death (apoptosis) is compared [4-7]. Despite the good results obtained in the

treatment of various cancers, adverse effects and complications resulting from the use of this drug on other organs such as the liver and the kidneys has been demonstrated [12]. Today the fight against cancer, especially in fast-growing tumors that have been associated with good luck. Cancer treatment due to fundamental limitations faced a lot of problems. In order to achieve compounds with anti-cancer properties of a series of screening tests is required. Meanwhile, research on the acquisition of anticancer agents from plant sources may be more widespread every day [13]. Discover great impetus to research in the field of drugs of plant origin search has anticancer drugs of plant origin [13]. Brassicacea family plants are grown widely throughout the world and are used. Brassica rapa has a great variety of species, is including turnip (*Brassica rapa* var *rapa* Turnip) [14]. Turnip has biologically active compounds such as: 1 - Flavonoids include Isorhamnetin, Kaempferol and Quercetin glycosides 2 - phenylpropanoids derivatives (15), 3 - indole alkaloids 4 - Glycosides sterol 5 - Ascorbic acid and vitamin A, niacin and riboflavin [16-17].

Antioxidant properties of phenolic compounds such as flavonoids are related to the turnip. Phenolic compounds by removing free radical scavenging antioxidant role and its exercise. Potassium in turnip, fat is counteracted and arsenic in white and red blood cell formation is involved. There are also vitamins A, B and C in leaves and roots as well as an important indicator of its role in maintaining the balance and especially nerve supply is in balance. Turnip extract will dissolve urate stones. And the kidney stones can be dissolved. Due to its insulin-like effects on turnip is also used to treat diabetes. Also turnips, relieves extract pain caused by arthritis and gout [17]. According to Liver importance and according to that liver disease is the most common. The purpose of this study was to examine the effect of turnip extract in reducing toxicity of chemotherapy is cyclophosphamide on liver enzymes in rats.

#### METHODOLOGY

This study has been carried out experimentally and completely random. All the ethics of working with laboratory animals have been observed in this study. 42 rats weighing  $180 \pm 10$ g and 75 days of age were obtained from the Jahrom Animal Room. The rats were in experimental conditions include a temperature of  $22 \pm 2$  ° C and 12 h light and 12 h dark cycle in Animal Room of Islamic

Azad University of Jahrom Branch for 21 days. The rats were kept in steel mesh door cages and a standard rodent diet (pellete) was used. Water was providing in especial glass bottles. Their Cage is disinfected with 70% alcohol 3 times a week. The rats were free in eating food and drinking water. For producing 5mg/kg B.W dose of cyclophosphamide, 50 mg tablets and the powder was dissolved in 10ml saline solution. To prepare turnip extract, turnip roots after drying to a powder using an electric grinder and Soxhlet extraction methods (soxhlet) was used. In this way, for every 10 grams of turnip powder, 200ml respective solvents containing water and ethanol were added and the Soxhlet apparatus, and the extract was separated from the solvent using Rotavapor apparatus [18]. Samples (saline solution, turnip extract, and cyclophosphamide) in a volume of 0.2ml were injected intraperitoneally every day at 9 am.

42 rats were divided randomly into 6 groups as follows:

**Group C:** were maintained on normal without any medication.

**Group S:** Rats in this group received saline solution as solvent of cyclophosphamide and turnip extract.

**Group T250:** Rats in this group received turnip extract 250mg/kg B.W.

**Group C5:** Rats in this group received cyclophosphamide 5mg/kg B.W.

**Group CT125:** Rats in this group received cyclophosphamide 5mg/kg B.W with turnip extract 125mg/kg B.W.

**Group CT250:** Rats in this group received cyclophosphamide 5mg/kg B.W with turnip extract 250mg/kg B.W.

After 21 day period, all groups of rats were unconscious by the ether. The heart of the syringe 5 ml blood sample was collected. After separation of blood serum, enzyme activities of ALT, AST, ALP in serum were measured. One-way ANOVA for comparison between treatments and followed by t-test and Duncan test was used for multiple comparisons between groups. ( $P < 0.05$ ) level was considered significant. Data analysis and statistical testing was performed using SPSS, version 18.

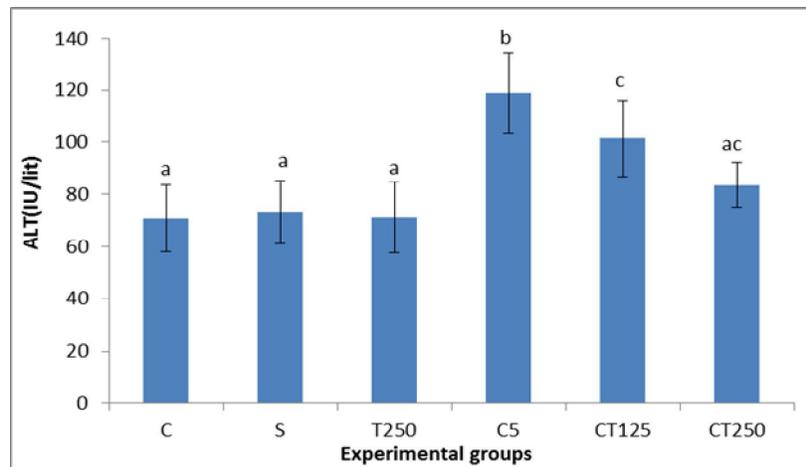
## RESULTS

Based on **Figure 1** in order to liver tissue

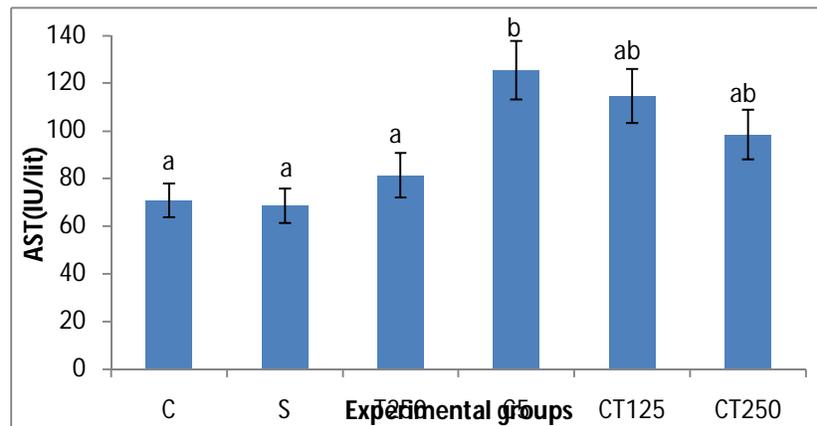
damage that cyclophosphamide exerts is caused ALT enzyme activity is significantly increased in C5 group than C group. Group CT125 and CT250 deleterious effects of cyclophosphamide in group decreased than C5 group.

Based on **Figure 2** along with the liver tissue damage that cyclophosphamide exerts is caused AST enzyme activity significantly increased in group C than C5 group. Group CT125 and CT250 deleterious effects of cyclophosphamide in group decreased than C5 group.

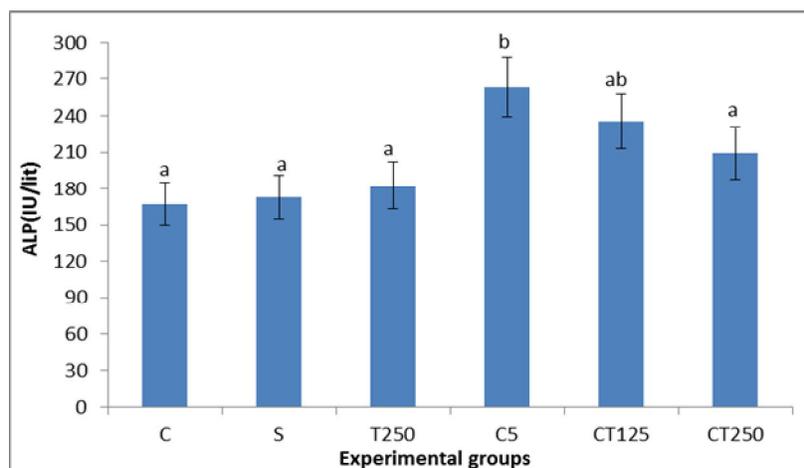
According to **Figure 3**, in which cyclophosphamide exerts its tissue damage to the liver is caused ALP enzyme activity caused a significant increase in group C5 than group C. In CT125 group, reducing the deleterious effects of cyclophosphamide reduced enzyme activity compared to the C5 group. CT250 group is significantly reduced than C5 group ( $P < 0.05$ ).



**Figure 1: Effect of Cyclophosphamide and Turnip extract on ALT activity. The Culmnes that Have at Least One Common Letter, have not Significant Different From Each Other at the Level of P <0.05**



**Figure 2: Effect of Cyclophosphamide and Turnip Extract on AST Activity. The Culmnes that have at Least One Common Letter, Have Not Significant Different From Each Other at the Level of P <0.05**



**Figure 3: Effect of Cyclophosphamide and Turnip Extract on ALP Activity. The Culmnes that Have at Least One Common Letter, have not Significant Different from Each Other at the Level of P <0.05**

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**DISCUSSION**

ALT, AST and ALP are liver enzymes. By examining the activity of this enzyme in serum, liver damage can be realized [19-20]. Cyclophosphamide, an alkylating agent that belongs to a group of Exazaphosphorine. This combination cytostatic properties, cytotoxicity, and is mutagenic. Virtue of its toxicity to the cells to DNA alkylating the N7 position of guanine and forming cross link between DNA-DNA and DNA-Protein and DNA is single stranded, which ultimately results in loss of normal function of nucleic acids and inhibits DNA synthesis [21]. Cyclophosphamide is inactive in vitro and in vivo, in the liver by the enzyme cytochrome P-450 4 - hydroxy cyclophosphamide is converted with its tautomer aldophosphamid in balance. Aldophosphamid to spontaneously decomposes and is converted to its active metabolite Phosphoramidmostard and Acroline [22-23]. Antineoplastic effects of cyclophosphamide is Phosphoramidmostard . Acroline by interfering with the antioxidant defense system in the tissues, the production of oxygen free radicals. Acroline the appearance of toxic effects, including cell death, apoptosis and necrosis is composed of several tumors [24-26]. Cyclophosphamide passes through the blood - brain barrier, converted in the liver to active metabolites

and ultimately be excreted through the kidneys [27]. AST is a microsomal enzyme that is found in large amounts in the liver and the hepatic tissue destruction is released in large amounts in the blood [28]. Thus increasing the activity enzymes ALT, AST and ALP in groups of cyclophosphamide is logical. CT125 and CT250 and C5 groups have increased significantly than group C. This change reflects the toxicity of cyclophosphamide on liver enzymes. Today, the increased biological compounds with antioxidant properties that is capable of various cells and tissues, including disorders of the liver against reactive oxygen species and free radicals to protect [29-30]. Turnip extracts contain antioxidants, which are among the flavonoids, vitamin C and many other compounds [16-17]. Flavonoids may have beneficial effects in various diseases. The turnip extract has anti-inflammatory properties [31]. Flavonoids and Cinnamic hydroxy acid and derivatives, which are abundant in turnip root, quartiles and the elimination of free radicals, are potent antioxidant properties [32]. Turnip has quercetin that has high antioxidant flavonoids [16]. In the present study, in CT125 and CT250 groups ALT levels decreased significantly than C5 group is shown. CT250 activity of ALP was significantly decreased in

the group that has been shown to have antioxidant effects of the extracts.

## CONCLUSIONS

The results indicate that cyclophosphamide increased reactive oxygen species can cause damage to the liver and increased serum liver enzyme activities. Turnip extract also has antioxidant properties and is somewhat reduces the negative effects of cyclophosphamide. Thus turnip extract to reduce cyclophosphamide-induced toxicity in cancer patients is recommended.

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