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Research Article

Assessment of the Effect of *Cynara scolymus* Diet on Liver Functions in terms of Biochemical Results

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Abstract

It is referred to the general characteristics of the *Cynara scolymus* plant, and the effects of its active ingredients in this study. The distribution of the plant in Turkey and the world is explained. The liver functions in body, its interaction with *Cynara scolymus*, and the changes made by *Cynara scolymus* in ALT and AST enzymes were examined.

The effects of *Cynara Scolymus*, frequently used in the Mediterranean diet, on healthy nutrition have been mentioned. *Cynara scolymus* preparations available in the market were examined. To determine the authenticity of the studies, 20 healthy volunteers were studied. The effects of *Cynara scolymus* on the liver were noticed after 3 months of observation with volunteers using the *Cynara scolymus* diet or *Cynara scolymus* supplement. There are significant differences between the mean values and the blood values before the start of the study. It is thought that this effect is due to the active ingredient of Cynarine, which is mostly found in the *Cynara scolymus* leaves. The decrease in the values in the male group was higher than that of the females.

Keywords: cynara scolymus; diet; liver functions; biochemical results

Introduction

The genus *Cynara* L., which belongs to the *Compositae* (Daisy family) family, has three species in Turkey and eight species in the world. The genus *Cynara* can be divided into two categories, wild species and medicinal species [1].

Cynara scolymus L. is a plant that has been used as a food in the Mediterranean diet, for supportive or therapeutic purposes from past to present, and registered in various pharmacopeias and monographs [2].

The edible part of the *Cynara scolymus* is the flower head [3]. The part of the plant used for treatment is the stem and leaves [4]. The active substances are concentrated in the leaves [5].

Cynara scolymus leaves contain sesquiterpene lactones and flavonoids such as caffeic acid derivatives, neochlorogenic acid, chlorogenic acid, cryptochlorogenic acid, and cynarine [6].

Cynara scolymus leaves have been used for many years in liver problems and digestive complaints [7]. Extracts prepared from the *Cynara scolymus* leaves accelerate liver regeneration, and increase the rate of bile formation and excretion [8]. The plant also has antispasmodic, antimicrobial, diuretic, antioxidant, and antifungal effects [9].

It is mentioned in the monographs that *Cynara scolymus* leaves can be used in digestive system complaints, liver and bile disorders [10].

We see within the scope of all the information that the *Cynara scolymus* has been consumed for many purposes throughout the years, and it is proved that its effects have been proven by traditional use at first and by scientific researches later.

Our study aims to examine the effects of *C. scolymus* and herbal supplements found in Turkey on liver enzymes and to interpret the results of the Mediterranean diet.

Materials and Methods

Only the biochemistry data of the people who made the current *Cynara scolymus* diet (supplementary food or food containing *Cynara scolymus* 2 to 3 days a week) and had their blood values measured have been assessed.

Biochemistry data were analyzed at one-month intervals over three months.

The biochemistry laboratory analyzes of the hospitals the patients went to were evaluated.

Auto-analyzers were used as the device to measure blood values.

A total of 20 healthy volunteers were studied.

10 female and 10 male volunteers were examined.

The age ranges of the volunteers range from 18 to 65 years.

Results & Discussion

Although cynarine, which is the most important active ingredient of *Cynara scolymus* L., is found in the whole plant, its main concentration is available in the leaves. Therefore, most of the natural medicines obtained from the plant are prepared from its leaves. Cynarine is a phenolic acid that experts think is responsible for its cholagogue and choleretic effects. These two tasks are very important for the liver's health. This is because that the risk of liver damage increases if the bile is not sufficiently transported to the gallbladder [11].

In a study, the hepatoprotective effect (liver-protecting effect) of chlorogenic acid, cynarin, luteolin-7-glucoside, and quinic acid isolated from *Cynara scolymus* on CCl_4 (carbon tetrachloride)-induced destruction in hepatocytes of rats was investigated. In consequence of the study, we see that only cynarin

substance had a hepatoprotective effect [12].

In a study on rats, the protective effects of *Cynara scolymus* leaf extracts on the liver were examined. In this study, the hepatoprotective effect that may occur with the *Cynara scolymus* leaf extract before the destruction with CCl4 in rat livers was examined. Mitochondrial damage, formation of large vacuole, and swelling of the endoplasmic reticulum occurred in liver cells of CCl4-exposed rats. In contrast, no signs of damage were observed in mitochondria and endoplasmic reticulum in liver cells in the rat group given *Cynara scolymus* leaf extract before exposure to CCl_4. As a result of the research, it was determined that *Cynara scolymus* has a regenerative and protective effect on liver cells. Microscopic images of the changes in tissues are given in Figure 1 and Figure 2 [11].

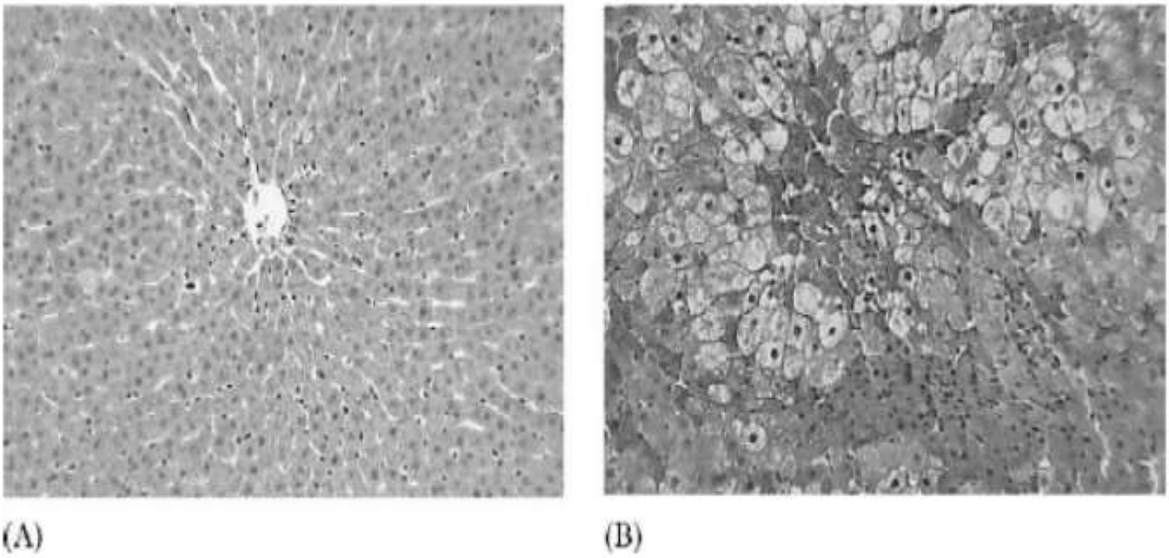

Figure 1: (A) *Microscope image of liver cells of rats in the control group (Magnification: x114).* **(B)** *Microscope image of cells in the damaged liver of rats exposed to CCl4 (Magnification: x114) [11]*

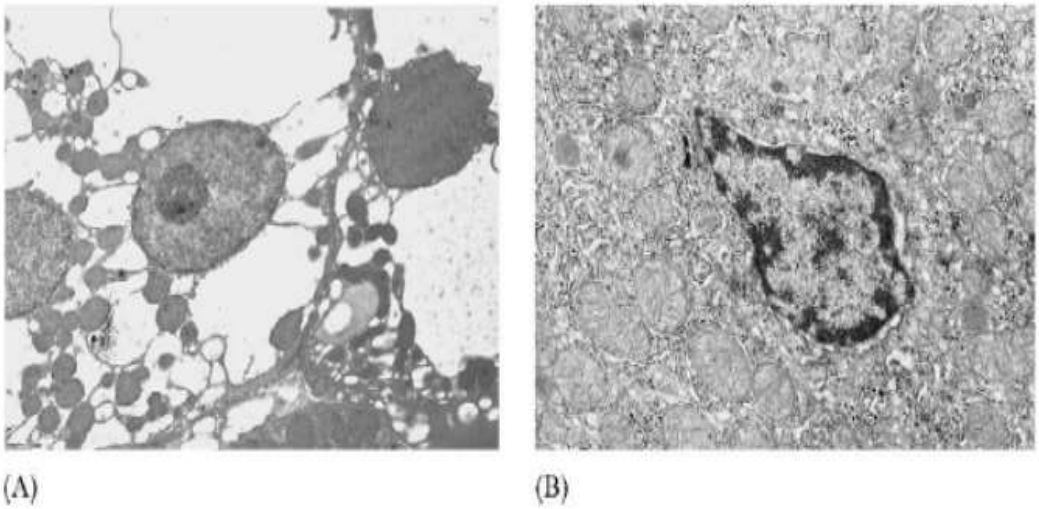

Figure 2: (A) *Electron microscope image of cells in the damaged liver of rats exposed to CCl4 (Magnification: x4000).* **(B)** *Electron microscope*

image of liver cells of rats given 2000 mg / kg Cynara scolymus leaf extract for preventive purposes [11]

The protective effect of *Cynara scolymus* on the liver and the changes in liver enzymes were examined in a study conducted. Significant changes were found in liver enzyme values obtained from rats in the group given *Cynara scolymus* leaf extract for two weeks before exposure to CCl_4. A decrease in malondialdehyde levels and liver enzymes and an increase in glutathione peroxidase levels were observed in rats in the extract group. Thus, the result that *Cynara scolymus* has a significant protective effect on the liver was once again supported [13].

Cynara scolymus and *Cynara cardunculus* grow in the Mediterranean region. It belongs to the *Compositae*, also known as the *Asteraceae* family [14]. *Cynara scolymus* species consumed in the Mediterranean Diet are rich in inulin, vitamins, minerals, fiber, and phenolics compounds [15].

The Mediterranean Diet is rich in grains, legumes, vegetables and fruits, characterized by moderate consumption of fish, large amounts of unsaturated fatty acids, low-to-moderate dairy products, low meat and moderate wine consumption. Studies have found an inverse relationship between the Mediterranean Diet and total mortality [16].

The results of blood values performed by 20 volunteers in different months are observed below. The volunteers were divided into two as ten females and ten males. The first month has the values before starting the *Cynara scolymus* diet or supplements, and the second month and third month show the values after use.

Volunteers were classified according to their gender, therefore we could see the differences between men and females more clearly.

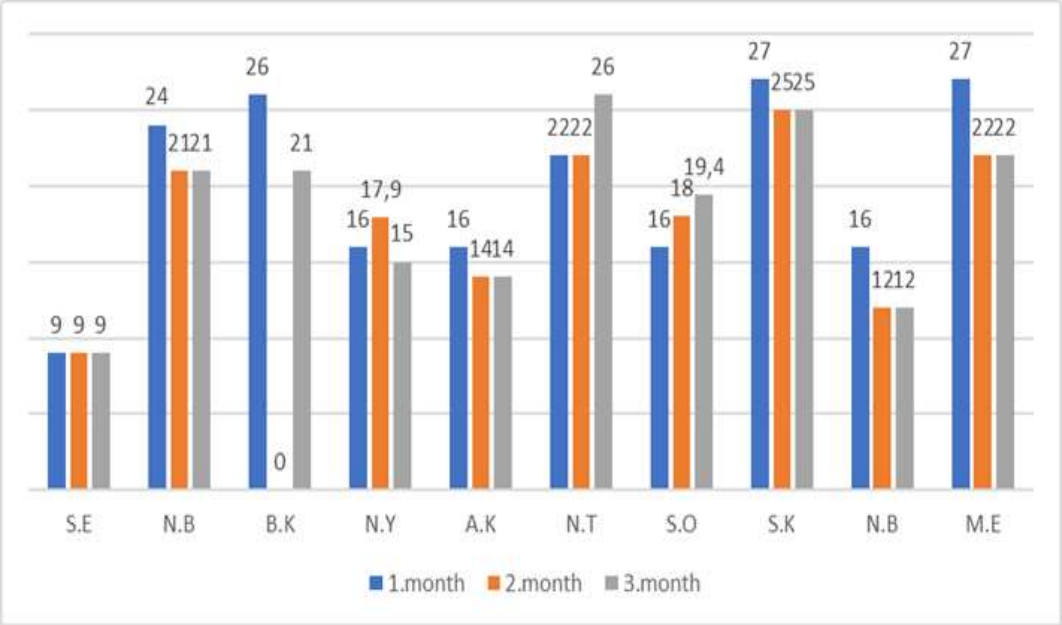

Figure 3: *ALT analysis results of females taken for every three months*

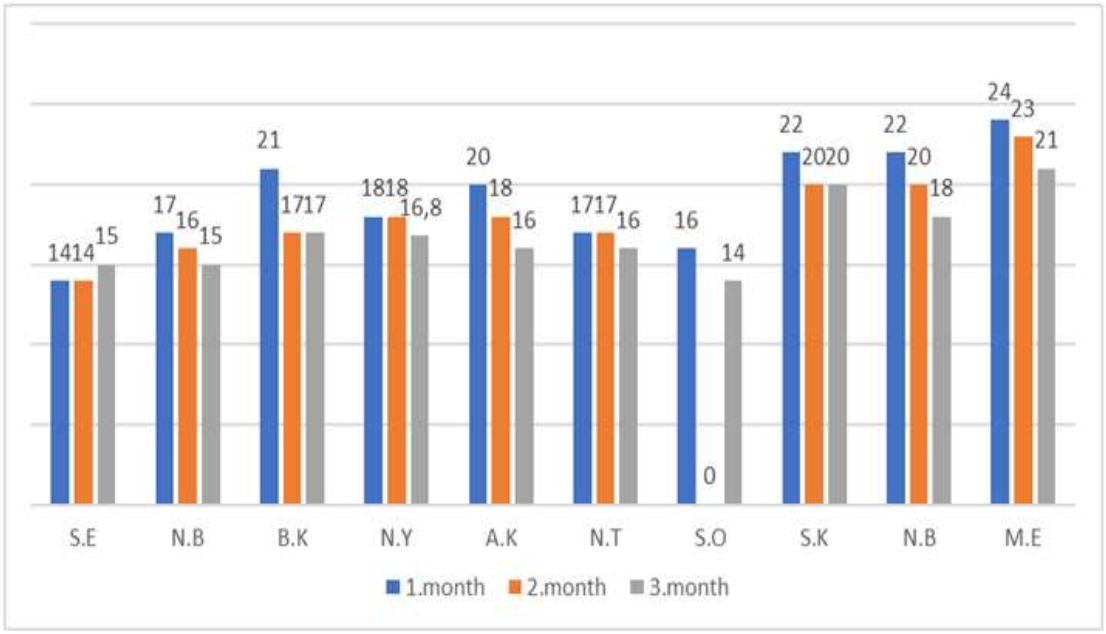

Figure 4: *AST analysis results of females taken for every three months*

There is a significant decrease in ALT and AST values in female, either separately or from the overall mean. This is considered to be due to the cynarine compound found in *Cynara scolymus* because cynarine is a phenolic acid that experts think is responsible for its cholagogue and choleretic effects and is the most important active ingredient of *Cynara scolymus* L [11].

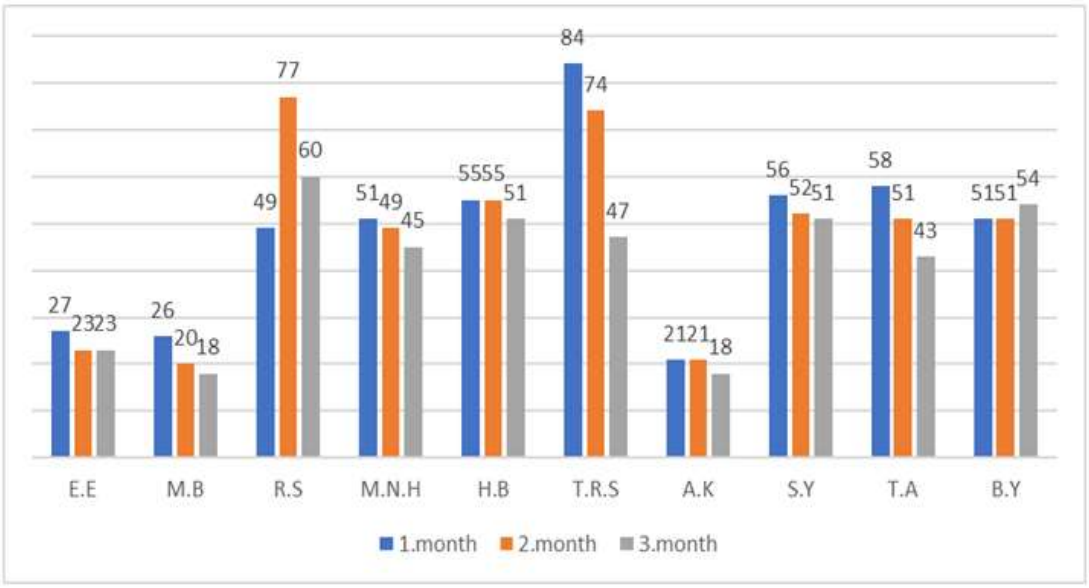

Figure 5: *ALT analysis results of males taken during three-months period*

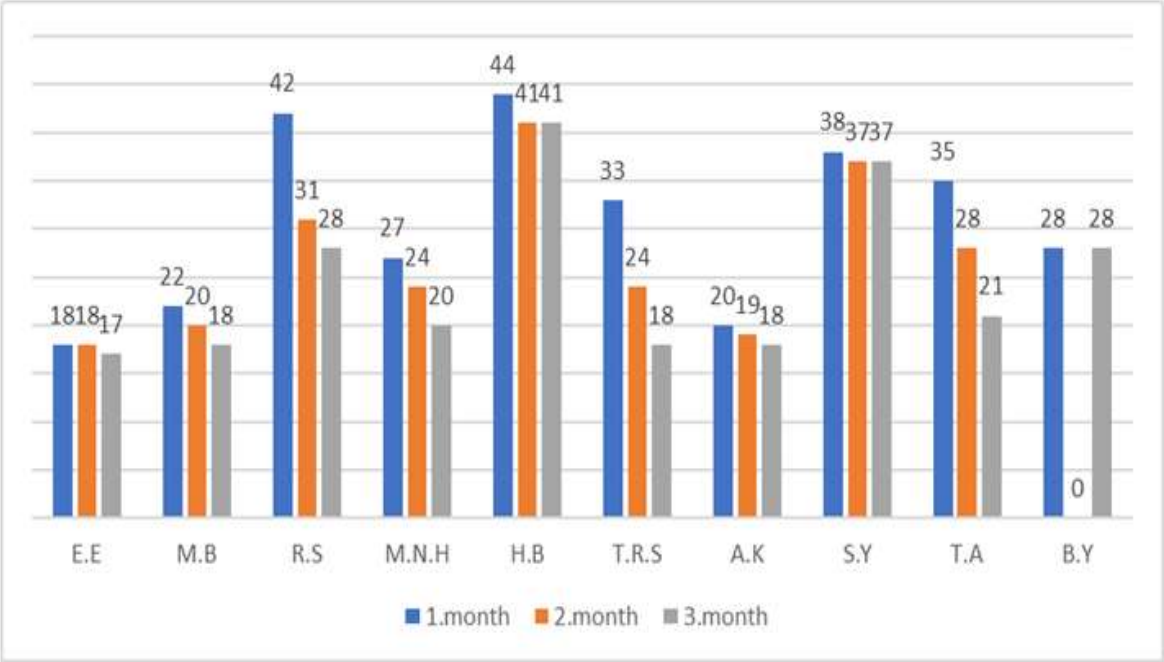

Figure 6: *AST analysis results of males taken for every three months*

There is a significant decrease in ALT and AST values in men as well as in female volunteers (Figure 3-6). The rate of decline in men is higher than in females volunteers. This is because the enzyme values of males before starting the *Cynara scolymus* diet and supplements are more irregular than females (Figure 3-6). The reason for the irregularity in their enzymes might be due to the irregular diet of males in their lifestyles or smoking and alcohol in their daily lives.

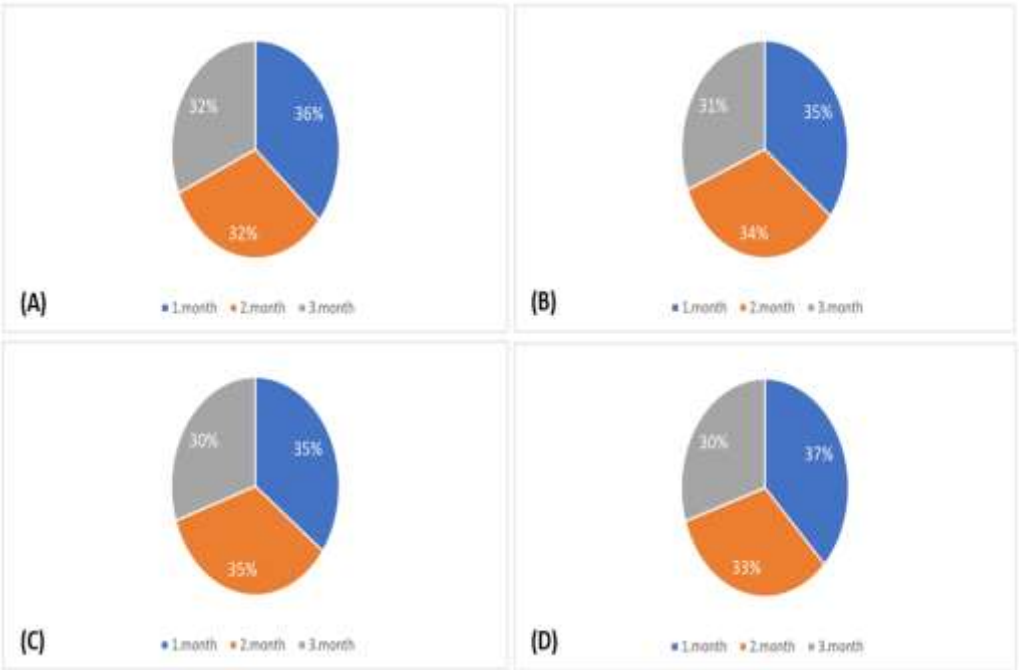

Figure 7: (A) *Mean ALT Percentages of Females*, **(B)** *Mean AST Percentages of Females*, **(C)** *Mean ALT Percentages of Males*, **(D)** *Mean AST Percentages of Males*

As seen in Figure 7-A, female's mean ALT levels decreased from 36 % to 32 %. AST enzymes decreased from 35 % to 31 % (Figure 7-B).

As seen in Figures 7-C and 7-D, male's ALT enzyme levels decreased from 35 % to 30 %, and AST levels from 37 % to 30 %.

It is estimated that there may be a further decrease in these values in the coming months in consequence of regular *Cynara scolymus* use.

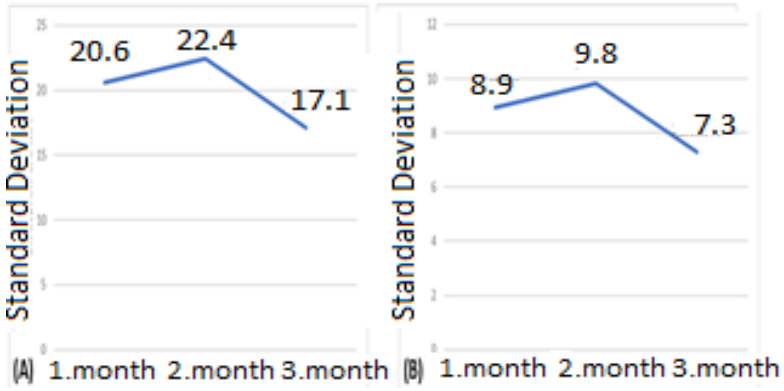

Figure 8: (A) *Standard deviation graph of ALT values over three months,* **(B)** *Standard deviation graph of AST values over three months)*

As seen in Figure 8, ALT and AST values were close to the mean at three months. A decrease in the standard deviation indicates a decrease in liver enzyme values.

Conclusion

When fed with a Mediterranean-style diet and taking *Cynara scolymus* supplements, the fatty liver will be prevented and protection against liver diseases will be provided.

Ethical Approval:

This study was initiated with the approval of Istanbul Medipol University Ethics Committee numbered 10840098-772.02-E.61563

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