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Investigating the Effects of Teasel on LiverEnzymes

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Abstract
Liver is a metabolic organ and it is responsible for detoxification of various materials. Harmful metabolic materials produced in other organs can affect itindirectly. Liver contains proteins and enzymes with large antioxidant capacities.It is assumed that oxidative stress that is caused by reactive oxygen species(ROS) causes various liver damages.Medicinal plants and other medicines derived from them have been known as important sources of medicine by humans since ancient times. Nowadays, ease of access to these drugs has caused the researchers to focus on their use strongly and investigatetheir medicinal properties. Teasel has steroid Saponins that act as natural Testosterone boosters. Teasel increases Testosterone by increasing Luteinizing hormone (LH). In the current study, low doses of Teasel have been unable to reduce the increase of the liver enzymes which are produced in response to resistance training, but doses of 10 and 15 mg/kg have been able to do it well.

Keywords: Liver, Teasel, Enzyme

1. INTRODUCTION

It is clear that physical activities and exercises affect different organs of the body and cause them to adapt themselves to different specific organic needs. Muscles, heart and the circulatory system, respiratory system and kidneys are among the systems that work differently during physical activities. So knowing about these effects and their controlling mechanisms is useful for planning the type of sport activity and exercise we do. Liver is a metabolic organ and it is responsible for detoxification of various materials. Harmful metabolic products produced in other organs can indirectly affect it. Liver contains proteins and enzymes with large antioxidant capacities.It is assumed that oxidative stress that is caused by reactive oxygen species (ROS) causes various liver damages.

Although sports activities and competitions have lots of advantages, they cause the homeostasis to disrupt temporarily due to their stressful nature. They may also have some destructive effects if they are not practiced and performed scientifically and systematically. Generally, the energy required by different organs of the body to function properly is released during a series of chemical reactions, and the enzymes are effective in accelerating these reactions. These enzymes, during sports activities,are aminotransferase (AST) or serum glutamic-oxaloacetic transaminase (SGOT) and alanine aminotransferase (ALT) or Serum glutamic pyruvic transaminase (SGPT). AST exists in the liver, heart, skeletal muscles, kidneys, brain, pancreas, lungs and white and red blood cells. ALT exists in the liver, kidneys and to a lesser extent in the heart and muscles and ALP is found in the kidneys, liver, bones, a

little in the skeletal muscles, small intestine and leukocytes.During intense activities, this enzyme transfers metabolites (such as lipids and amino acids) from the cell membrane to produce oxidative energy (Bashir et al., Clarkson et al., 2006).The increase of ALP after exercising indicates the increase of liver activity for gluconeogenesis, fat peroxidation, and sometimes an increase in the bone formation, which all depend on the duration and intensity of the competition. These enzymes are involved in the transfer of amines from aspartate and alanine to glutaric acid.Doing this, they produce oxaloacetic acid, pyruvic acid and ATP energy in mitochondria and gluconeogenesiswhile oxygen is available. These enzymes directly indicate the damage of liver or muscle cells or the increase of permeability in cell membrane during or after intense activity and also their release (enzymes) into the systemic circulation. If the ratio of AST/ALT is greater than one, it indicates overload or damage of liver or muscle cells during the competitions.

Teasel is used as a diuretic. It also excretes stones in urinary tracts and enhances sexual power.
Nowadays ordinary people exercise a lot of resistance training. And recently, the athletes have turned to strength trainingand use it to keep in shape and healthy. Also, resistance sports are widely used in rehabilitation programs and they have become popular as an important training method for keeping in health. Therefore, the mechanisms that explain the effect of resistance exercises on muscle-skeletal growth are important and they have always been paid attention to. Accordingly, the changes of body enzymes during a period of or a single physical activity are important. Identifying the effect of various activities on this system and realizing its positive and negative aspects, we can assure sports doctors and coaches that the required training does not exceed the appropriate level of enzyme activity. The liver is the largest organ in the body of vertebrates and it is responsible for intensive metabolism.

Liver diseases are among the serious health problems and they are mainly caused by toxic chemicals.Despite the huge advances in allopathic medicines, no effective medicine is available to protect liver. The liver is the main target tissue for toxic compounds (Bashir et al.). Liver cells store various substances such as triglycerides, glycogen and vitamins.Their metabolic functions such as gluconeogenesis or conversion of fats and amino acids into glucose and deamination of amino acids is to produce urea.

Aminotransferases (GOT and GPT) are reliable liver enzyme markers. They are the first enzymes to diagnose liver damages. Liver diseases are among the serious health problems.There are some medicinal plants that canhave a vital role in the treatment of liver diseases.
Teasel is a plant that grows in subtropical zones. The Bulgarian teasel is a type of this plant that is used in dietary supplements. Bulgarian teasel is used to increase energy, sexual libido and muscle mass. Teasel has steroidal saponin and acts as a natural testosterone booster. Teaselincreases testosterone by increasing luteinizing hormone (LH). It is also a sexual enhancer. In Iraq, this plant is used as an antihypertensive and a diuretic (Ahmad et al., 2009).

2. Plasma Enzymes

There are two types of enzymes in plasma (Leninger, 2003, Murray Graner and Mais Rodwell, 2002):

1. Enzymes that have a specific function in the blood, such as coagulation factors.
2. Enzymes that enter the blood as the result of damage of the cells and their disintegration.

1. In healthy men, enzyme activity is relatively low. But the amount of some plasma enzymes increases after exercising (CK) and eating (ALP). The increase of the amount of plasma enzymes due to their abnormal leakage from the cells and their entry into the bloodstream depends on one of the following conditions:
2. Necrosis or severe damage of the cell. This happens when blood does not reach the cell or it is because of toxic substances. These enzymes are among the enzymes of the cell cytoplasm.
3. Increase of cell proliferation: This occurs in neoplastic diseases or when the activity of osteoblasts increases.
4. Increase of enzyme density inside the cell: this happens in some diseases or when the person takes some drugs such as such as gamma-glutamyltransferase.
5. Obstruction of bile ducts: such as the increased activity of alkaline phosphatase enzyme

2.2.2 The role of enzymes in biological activities

Enzymes exist in all parts of the body. Measuring them provides us withvaluable diagnostic information. Enzyme measurement is usually done in serum while we can measure enzymes in other fluids of the body. A small amount of intracellular enzymes can be found in the blood. This is because of the natural change and transformation of cells (Ghojegh, 2008).
Enzymes are a group of protein substances that carry out biological reactions. Most of the biochemical reactions are done with the help of enzymes (Murray Graner and Mais Rodwell, 2002). These substances can only take part in one type of reaction and a very small amount of them is sufficient for biochemical reactions.Generally, enzymes act specifically. They are very sensitive toward the substance that is affected by them. Any small disorganization in their host substances affects their action. The degree of specificity of an enzyme depends on the type of enzyme.

There are usually three substances which take part in the biochemical reactions that are catalyzed by the enzymes:

1. The substrate or the fabric of the substance that is affected by the enzyme.
2. Enzyme or coenzyme and enzyme cofactor that affects the substrate.
3. The product that is produced during the reaction (Leninger, 2003, Murray Graner and Mais Rodwell, 2002).

Factors affecting the speed of enzyme reaction

Heat: the increase of temperature causes the molecules to move more and faster so the speed of the chemical reaction is also increased. Each enzyme acts its maximum in a certain temperature. This suitable temperature is called enzyme optimum temperature. Human body's enzymes act their maximumbetween 37 to 41 degrees Celsius (Leninger, 2003).

pH of the environment: The pH of the environment has a great effect on the enzyme reaction. Too acidic or too alkaline pH changes the structure of enzymes irreversibly. pH affects the binding of enzyme and its substrate, and it often causes the amino acid to be separated from the active site of the enzyme (Leninger, 2003).

Enzyme density: The speed of an enzyme reaction in the presence of a large amount of substrate is correlated positively with the enzyme density. But if the enzyme density continuesincreasingly, the reaction speed will no longer increase due to the lack of substrate after a while. There is a linear correlation between the enzyme density and the enzyme reaction speed (Leninger, 2003).
Substrate density: If the temperature, pH, the amount of enzymes and cofactors remain constant, the density of the starting material will be another factor that can affect the speed of the enzyme reaction.If the substrate increases, the reaction speed will increase, too. And this increasing speed will continue for a specific period of time (Leninger, 2003).

Figure 1-Teasel plant

Medicinal plants and the medicines derived from them have been long known as important sources of medicine by mankind. Nowadays, due to the ease of access to these medicines, there is a lot of focus on their use and research on their properties. They are among the important natural resources on earth and they have been used by humans since ancient times.Medicinal plants have been used to relieve the pains and treat many diseases in traditional medicine. Teasel is one of these medicinal plants which is fromthe family of Zygophyllaceae plants.
Teasel has been used to treat various diseases due to its medicinal nature. Terrestris teasel is fromthe family of Zygophyllaceae plants. It grows in warm temperature and it is found in the tropical areas of southern Europe, southern Asia, all overthe Africa and Australia. Teasel root and fruit is cool, diuretic, sexual enhancer, appetizing, tranquilizer and anti-inflammatory (Ana et al., 2011). Teasel fruits are collected in late summer and early fall. This plant is widely grown and distributed in different parts of the world so as it can be found in most parts of the world. This plant has resin,oil, alkaloid, polyphenols, and minerals including calcium, phosphorus, iron, sodium, potassium, sulfur, nitrogen, and chlorine. It also has five types of glycoside substances, all of which contain glucose. Apart from glucose, they have rhamnose and arabinose.

Teasel has steroid Saponins that act as natural Testosterone boosters. It increases Testosterone by increasing Luteinizing hormone (LH).It is also a sexual enhancer. In Iraq, this plant is used as an antihypertensive and a diuretic (Ahmad et al., 2009). Teasel extract is used to reduce blood lipids and this property has caused the traditional medicine to use it as a weight reduction and anti-obesity method (Gibani, 2005).

3. MATERIAL AND METHODS

The purpose of the present study is to discover the cause and effect relationship of the independent and dependent variables. As this research has been conducted on rats and all the distracting factors have been completely controlled, it is considered as an experimental research.

The training program lasted 8 weeks and it was done three days a week.The rats only climbed the 26-step ladders and they performed this in three sets. The recess between each two sets was three minutes.The injection of the aqueous extract of teasel was done intraperitoneally from the lower part of their chestsusing an insulin syringe.

Table 3.1 Exercise protocol

group	grouping	Resistance exercise	testosterone	Extract injection			Stanozo
				5 mg	**10 mg**	**15 mg**	
1	control						
2	1 dose ofaqueous extract of teasel			×			
3	2 doses of aqueous extract of teasel				×		
4	3 doses of aqueous extract of teasel					×	
5	Resistance exercise with 1 dose of aqueous extract of teasel	×		×			
6	Resistance exercise with 2 doses of aqueous extract of teasel	×			×		
7	Resistance exercise with 3 doses of aqueous extract of teasel	×				×	
8	Stanozololdrug						×
9	Resistance Exercisewith Stanozolol drug	×					×
10	testosterone		×				

preparing the aqueous extract of teasel

One gram of teasel is poured in distilled water. After this, one CC of this solution has one milligram of the aqueous extract of teasel.

Liver sampling

Liver homogenization was done

9-3 Measurement tools and methods

Animal feed was got from Behparvar company, which included:

19/5-20/5	Crude protein%
3/5-4/5	Crude fat%
4-4/5	Crude fiber%
At most 10	Ash%
0/95-1	Calcium%
0/65 -0/7	Phosphorus%
0/5-0/55	salt%
At most 10	humidity%
1/15	Lysine%
0/63	Methionine+cysteine%
0/72	Threonine%
0/25	Tryptophan%
16/16-17	energy

10-3 Method of measuring serum AST
In the present study, serum AST was obtained based on U/L unit using enzymatic colorimetric method.

Result:

minimum	**maximum**	**mean ± standard deviation**	**number**	**Group variable**
91/99	92/99	92/5±0/30	**9**	**Stanozolol + resistance exercise**
93/19	94/05	92/7±0/35	**9**	**15 mg/kgof teasel extract+ resistance exercise**
93/19	94/07	93/6±0/30	**9**	**resistance exercise**
93/96	95/21	94/6±0/34	**10**	**Stanozolol drug**
92/86	94/08	93/7±0/19	**9**	**15 mg/kg of teasel extract**
90/55	98/08	94/0±2/17	**9**	**control**

Table 4-22.Data (mean ± standard deviation) in different groups of stanazolol + resistance activity, 15 mg/kg of teasel extract + resistance activity, resistance activity, 15 mg/kg of teasel extract, control and drug stanazolol for ALT enzyme.

The results of one-way variance analysis showed a significant difference between the ALT data of the targeted groups in hypothesis 11 (F=0.000, 7.11=49.5).The results are shown in Table 23-4. The results of LSD post hoc test are reported in Table 23-4. Therefore, the assumption of the research that there is no difference in the liver ALT enzyme of the healthy male rats after performing a period of resistance training and taking 15 mg/kg of the aqueous extract of teasel is rejected. In other words, it can be said with 95% confidence that the consumption of 15 mg/kg of teasel along with resistance exercise in healthy male rats compared to the control groups, the stanazolol drug group and resistance training group, causes different changes in liver ALT enzyme.

4. CONCLUSION

Investigating the effects of medicinal plants on sports performance and health has recently gained the attention of many researchers (Shekelleh, Hardy et al., 2003). Research data in this case is very limited and we cannot justify the effect mechanism of all medicinal plants along with physical activity and exercise properly (Dara et al., 2008). Teasel extract has been used to treat urinary infections, urinary stones, inflammations, edema, injury and lowering blood pressure. It also has anabolic effects and increases muscle strength. And so far, no research has been conducted about its effects on liver enzymes in response to resistance training in male rats. Research shows thatthere an increase in liver enzymes after doing endurance and resistance training. Likewise, in the current study, low doses of teasel could not reduce the increase in liver enzymes in response to resistance training, but doses of 10 and 15 mg/kg have shown their useful effects to prevent tissue damages caused by the activities and the lack of release of liver enzymes into the bloodstreamso that the amount of AST and ALT liver enzymes have decreased by about 2% compared to the control group with doses of 10 and 15 mg which was also significant. However, in the group that only resistance activity was performed without any teasel extract, a 4% increase in liver enzymes was observed. In fact, the consumption of teasel in high doses has significantly reduced the 2% increase in the amount of liver enzymes.Regarding the increase of liver enzymes in resistance activities, Raymond et al. (2001) investigated the changes of aminotransferases in bodybuilding athletes who used anabolic steroids. They found that resistance training along with anabolic steroid misuse causes the release of aminotransferases in the blood circulation.

5. REFERENCES

1. Aggarwal, S. Tandon, S. K. Singla, C. Tandon, 2010, Diminution of Oxalate Induced Renal Tubular Epithelial Cell Injury and Inhibition of Calcium Oxalate Crystallization in vitro by Aqueous Extract of Tribulus terrestris, International Braz J Urol.
2. A.V. Kavitha and G. Jagadeesan, 2006, Role of Tribulus terrestris (Linn.) (Zygophyllacea) against mercuric chloride induced nephrotoxicity in mice, Mus musculus (Linn.), Journal of Environmental Biology,.

3. Ahmed A. Hussain, Abbas A. Mohammed, Heba. H. Ibrahim, and Amir H. Abbas,2009, Study the Biological Activities of Tribulus Terrestris Extracts, World Academy of Science, Engineering and Technology 57.
4. Al
5. essio, H. M., A. H. Goldfarb, et al.,1997, "Exercise-induced oxidative stress before and after vitamin
6. Amacher, D.E,1998, Serum transaminase elevations as indicators of hepatic injury fallowing the administration of drugs. Regulatory toxicology and pharmacology 27: 119 -130.
7. Amin, A., M. Lotfy, et al,2006, "The protective effect of Tribulus terrestris in diabetes." Annals of the
8. Ana Paula Tanno a,1, Vander José das Neves a,1, Kaleizu Teodoro Rosa b, Tatiana Sousa Cunha a,c,Fernanda Cristina Linarello Giordano a, Caroline Morini Calil a, Vinicius Guzzoni a, Tiago Fernandes d, Edilamar Menezes de Oliveira d, Pedro Duarte Novaes e, Maria Cláudia Irigoyen b, Maria José Costa Sampaio Moura f, Fernanda Klein Marcondes,2011, Nandrolone and resistance training induce heart remodeling: Role of fetal genes and implications for cardiac pathophysiology, Elsevier Inc. and exercise **25**(2): 225.
9. Anderson J. Martino-Andrade[a],Rosana N. Morais[a], Katherinne M. Spercoski[a], Stefani C. Rossi[b], Marina F. Vechi[b], Munisa Golin[b], Natália F. Lombardi[b], Cláudio S. Greca[c], Paulo R. Dalsenter[b], Effects of Tribulus terrestris on endocrine sensitive organs in male and female Wistar rats, 2003, International Braz J Urol.
10. Apple, E.S. & MC Gue, MK.,1983,"Serum enzyme change during marathon training".Am J Clin Pathology. 79: 716-719.
11. Azita Hajhossein Talasaz1, Mohammad-Reza Abbasi2, Saeed Abkhiz2 and Simin Dashti-Khavidaki,2010, Tribulus terrestris-induced severe nephrotoxicity in a young healthy male, Nephrol Dial Transplant, 25: 3792–3793.
12. BABA, C. S., ALEXANDER, G., KALYANI, B., PANDEY, R., RASTOGI, S., PANDEY, A. and CHOUDHURI, G, 2006, Effect of exercise and dietary modification on serum aminotransferase levels in patients with nonalcoholic steatohepatitis. Journal of Gastroenterology and Hepatology, 21: 191–198. doi: 10.1111/j.1440-1746.2005.04233.x
13. Bashir Jabbar, Gaeini Abbas Ali , Hojat Allah Nibakht, Zehsaz Farzad, Hadi hamdollah, The Effect of creatin Monohydrate supplementation with resistance training on liver responces in sedentary males. C supplementation." International Journal of Sport Nutrition **7**(1): 1.
14. Cheung BM, Ong KL, Cheung RV, Wong LY, Wat NM, Tam S, et al, 2008 ,Association between plasma alkaline phosphatase and C-reactive protein in Hong Kong Chinese. Clin Chem Lab Med;46:523–7.
15. Cheung BM, Ong KL, Wong LY, 2009, Elevated serum alkaline phosphatase and peripheral arterial disease in the United States National Health and Nutrition Examination Survey 1999–2004. Int J Cardiol;135:156–61.
16. Clarkson, P., Kearns, A., Rouzier, P., Rubin, R., & Thompson, P, 2006, Serum creatinekinase levels and renal function measures in exertional muscle damage . Pediatric critical care medicine. 38(4): 623-627

17. Cordova, A., Francisco, MJ., Eduardo, R., & Melchor, A.M. ,2004, Protection against muscle damage in competitive sport player: the effect of the immunomodulater AM $_3$. J Sports sci.22(59) 827-833.
18. DaCosta D, Dritsa M, Ring A, Fitzcharles MA, 2004, Mental health status and leisure-time physical activity contribute to fatigue intensity in patients with spondylarthropathy.Arthritis Rheum 15; 51: 1004-8.
19. Daniel S, Ben-Menachem T, Vasudevan G, Ma CK, Blumenkehl M. 1999, Prospective evaluation of unexplained chronic liver transaminase abnormalities in asymptomatic and symptomatic patients. Am J Gastroenterol;94:3010-3014.
20. Dara, L., J. Hewett, et al, 2008, "Hydroxycut hepatotoxicity: a case series and review of liver toxicity
21. Dufour DR. Effects of habitual exercise on routine laboratory tests. Clin Chem 1998;44:136. exercise and training in rats." American Journal of Physiology--Legacy Content **207**(2): 467-472. from herbal weight loss supplements." World journal of gastroenterology: WJG **14**(45): 6999.
22. Fuad A.M. Hasan, Salim Owyed, 2003, Interpretation of liver chemistry tests. Bull Kuwait Inst Med Spec;2:27-31
23. G.Dhana Lakshimi, P. Ravi Komar, 2012, Protective effect of Tribulus Terrestris linn on liver and kidney in Cadmium intoxicated rats,Indian Journal of Experimental Biology.
24. Garbus, J., B. Highman, et al, 1964, "Serum enzymes and lactic dehydrogenase isoenzymes after
25. Ghazala Shaheen1*, Irshad Ahmad2, Khan Usmanghani3 Naveed Akhter1, Mukhtiar Ahmad1, Sabira Sultana1 and M. Akram, 2012,Monograph of Tribulus terrestris, Journal of Medicinal Plants Research.
26. Giannini, E.G., Testa, R., & Savarino, V, 2005, Liver enzyme alteration: a guide for clinicians. Canadian Medical Association. 172(3).39.
27. Giboney, P, 2005, Mildly elevated liver transaminase levels in the asymptomatic patient.American family physician
28. Giboney, P, 2005, Mildly elevated liver transaminase levels in the asymptomatic patient.American family physician.71(6):1105 -1110
29. Halonen, P.I., & Konttinen, A, 1962, Effect of physical exercise on some enzymes in the serum. Nature.193:942 -944.