

Evaluation of Changes of Factors Related to Liver Function in Serum of Horse by Administration of *Cichorium intybus*

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Abstract: Chicory (*Cichorium intybus*) is a plant that is cultured in some area of Iran, including Khuzestan. All of parts of the chicory especially its leave and root have medicinal properties. It is traditionally used for treatment icterus, renal failure, gout and arthritis in human. Important side effects were not reported from this plant. Excretion substances like uric acid are clinically important in some pathological conditions such as urecemia and icterus in horse. However the pharmacological effect of chicory was not evaluated in horses. The present study was conducted for evaluation effect of leave of chicory on changes of factors related to liver function in serum of horse. In this study, 8 Arabian horses were selected. They had 10-20 years and were clinically in normal conditions. The horses were fed routine diet. The dried leave of chicory was daily added to food of horses at 0.5 g/kg for 15 days. The blood of horses was daily collected before, during and 6 days after chicory administration. The serum was isolated and uric acid, Alanine Transferase (ALT), Aspartate Transferase (AST), Alkaline Phosphatase (ALP), Lactate Dehydrogenase (LDH), conjugated and total billirubin, total protein and albumin concentrations were measured. The mean of these factors were statistically compared. Chicory consumption did not statistically change concentration of above factors. Thus, chicory dose not affect concentration of ALT, AST, ALP, LDH, conjugated and total billirubin, total protein and albumin and uric acid in serum of horse in normal condition; but it may be benefit in pathological conditions.

Key words: Albumin, ALP, ALT, AST, billirubin, *Cichorium intybus*, horse, LDH, total protein, uric acid

INTRODUCTION

Chicory (*Cichorium intybus*) is a plant that is cultured in some area of Iran, including Khuzestan. It is a typical Mediterranean plant indigenous to Europe, Western Asia, Egypt and North America. All of parts of the chicory especially its leave and root have medicinal properties. It is traditionally used for treatment icterus, renal failure, gout and arthritis in human. Important side effects were not reported from this plant.

Chicory has several pharmacological properties. It has anti-diabetic effects of in streptozotocin-induced diabetic rats (Pushparaj *et al.*, 2007). Antibacterial activity of the water, ethanol and ethyl acetate extracts of chicory was investigated. All the tested extracts showed antibacterial activity, the ethyl acetate extract being the most active. Water extract of chicory inhibits *Agrobacterium radiobacter* sp. *tumefaciens*, *Erwinia carotovora*, *Pseudomonas fluorescens* and *P. Aeruginosa* (Petrovic *et al.*, 2004). Antimalarial activity of lactucin and lactucopicrin: sesquiterpene lactones isolated from chicory was seen (Bischoff *et al.*, 2004). An *in vivo* gastroprotective effect of chicory against ethanol-induced lesions was seen (Gürbüz *et al.*, 2002).

Chicory is still used today for its bitter-tonic, diuretic, digestive, lightly laxative and cholagogic properties, due to its content of mucilages, resins and bitter substances (Kalantari and Rastmanesh, 2000). Leaves are used as infusions for anemia and digestive disorders: roots are employed as infusion to purify the organism and to stimulate the appetite; flowers have cholagogic activity, but they are also utilized externally, such as in skin washing, cooling and softening (Poli *et al.*, 2002).

The effects of the ethanol extract of chicory on the immunotoxicity of ethanol were investigated in mice. The significant increasing in delayed-type hypersensitivity reaction, phagocytic activity, natural killer cell activity and cell proliferation as well as interferony (IFN-gamma) secretion was seen and the immunotoxicity induced by ethanol is significantly restored or prevented by chicory treatment (Kim *et al.*, 2002). The aqueous extract of chicory inhibits mast cell-mediated immediate-type allergic reactions *in vivo* and *in vitro* (Kim *et al.*, 1999). The content of magnolialide was shown to be highest in the leaves of chicory. The magnolialide inhibits the growth of several tumor cell lines (Lee *et al.*, 2000). The anti- and pro-oxidant activity of water-soluble components in chicory was investigated (Sultana *et al.*, 1995; Kim *et al.*, 2001; Papetti *et al.*, 2002).

Excretion substances like uric acid are clinically important in some pathological conditions such as urecemia and icterus in horse. However the pharmacological effect of chicory was not evaluated in horses. The present study was conducted for evaluation effect of leave of chicory on uric acid, ALT, AST, AST, LDH, conjugated and total billirubin, total protein and albumin concentrations changes in serum of horse at normal condition.

MATERIALS AND METHODS

The study was done in Ahvaz city-Iran during 2008 year. At this study, 8 Arabian horses were selected from one center in Ahvaz, Iran. They had 10-20 years and were clinically in normal conditions. The horses were fed routine foods. The leave of chicory was prepared and the plant was taxonomically identified as *Cichorium intybus* at department of Botany, school of Agriculture, Shahid Chamran University, Ahvaz, Iran. The dried leave of chicory was daily added to food of horses at 0.5 g/kg for 15 days.

The blood of horses was daily collected before, during and 6 days after chicory consumption. The serum was isolated and uric acid, ALT, AST, ALP and LDH, conjugated and total billirubin, total protein and albumin concentrations were measured in serum of horses in duration of study according to the method of commercial kits (from Pars Azmon Co. and Zist chimi Co., Iran). The mean of these factors were statistically determined using SPSS program and compared by one factor Analysis of Variance (ANOVA) and Fisher Least Significant Difference test (LSD). The minimum level of significance was $p \leq 0.05$.

RESULTS

At present study, the changes of serum concentration of ALT, AST, ALP, LDH, conjugated and total billirubin, total protein and albumin and uric acid was measured in Arabian breed horses during 14 days chicory consumption and one week later.

The mean of serum ALT concentration was 13.4 IU/L before chicory administration and 9.86 IU/L after 21 day.

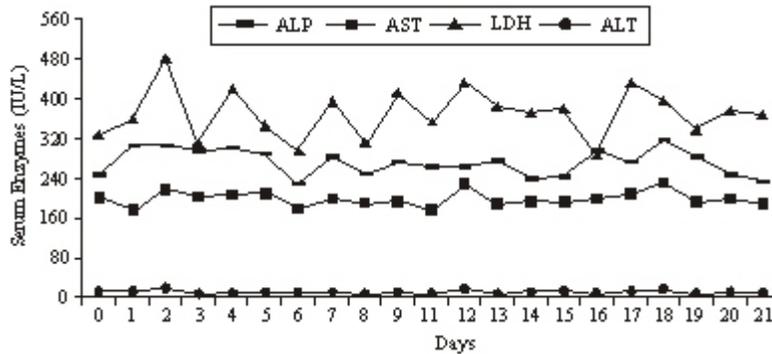


Fig. 1: Mean of serum levels of ALT, AST, ALP and LDH during study

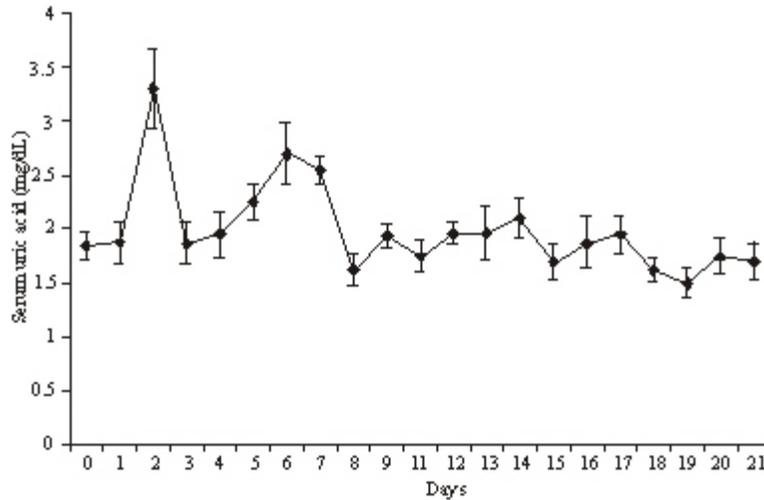


Fig. 2: Mean concentration of serum uric acid during study

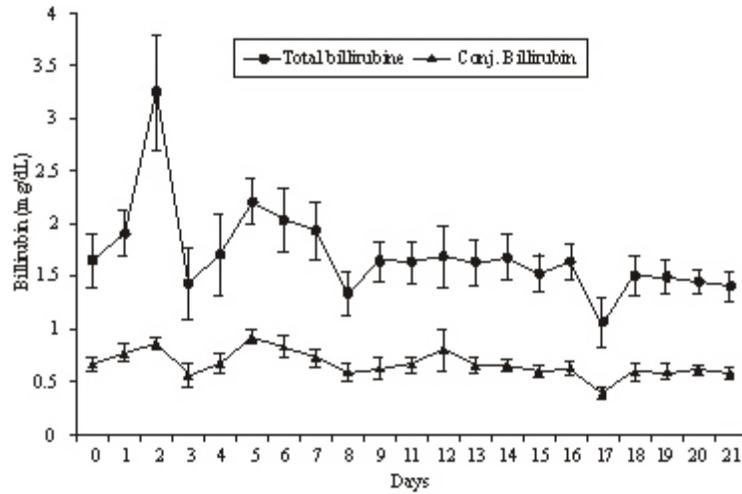


Fig. 3: Mean serum concentration of total and conjugated bilirubin of horses in during of study

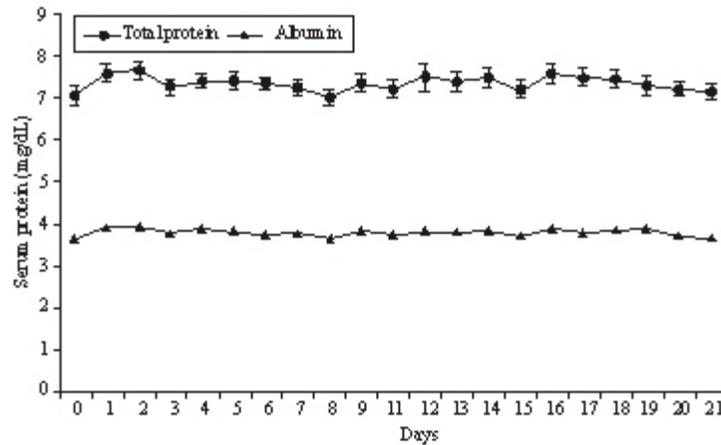


Fig. 4: Mean serum concentration of total protein and albumin in during of study

Although, ALT concentrations had fluctuations daily; but its elevation in 3rd day of study was considerable (Fig. 1). The mean of AST, ALP and LDH concentration was 201, 249.4 and 329.2 IU/L before chicory consumption respectively. Their serum concentrations were respectively measured 184.42, 234.42 and 369.29 IU/L in 21st day of study (Fig. 1). The elevation of LDH concentration in 3rd day was significant.

The mean of serum acid uric respectively was 1.85 and 1.7 mg/dL 1st and 21st day of study. Its concentration was significantly increased in 3rd day (Fig. 2).

The concentration of total bilirubin was 1.65 mg/dL at first day of study and reached to 1.4 mg/dL in 21st day of study. The mean level of total protein was significantly increased in 3rd day of study (Fig. 3). The mean concentration of conjugated bilirubin was 0.66 mg/dL before chicory consumption and reached to 0.57 mg/dL in 21st day of study (Fig. 3).

The mean level of serum total protein in horses respectively was 7.06 and 7.13 mg/dL in first and 21st day of study. This concentration was not changed by chicory (Fig. 4). The concentration of albumin was 3.65 mg/dL at first day of study and 3.67 mg/dL in 21st day of study (Fig. 4).

DISCUSSION

The results of present study show that use of chicory leaves as food additive in horse in normal conditions; dose not change serum levels of factors related to hepatic function. The concentration of all evaluated factors (ALT, AST, ALP, and LDH, conjugated and total bilirubin, total protein and albumin) was normal range in horse but level of uric acid was more than normal range (Coles, 1986; Kaneko *et al.*, 1989; Carlson *et al.*, 2002). We did not find reason of this difference but it may change under training

and exercise (Räsänen *et al.*, 1996; Ishida *et al.*, 1999). In addition, at least chicory has not side effects on factors, which evaluated at this study. However, the dose was adjusted (0.5 mg/kg) based on experimental studies in other animals especially laboratory animals; because our study is first evaluation of effect of chicory in horse. It is needed the several doses are evaluated in Arabian horse and other breeds for exact judgment. However, it is needed that different source of chicory is evaluated; because quantity and contain of plant from different area may be variable. Schaffer *et al.* (2005) confirmed this subject. They shown the extract of aerial parts of from Greece, Italy and Spain have different antioxidant potency based on geographically dependent environmental conditions (Schaffer *et al.*, 2005).

The results of one study suggest that the improved lipid metabolism observed in rats fed chicory extract (mainly inulin component) may be caused by an alteration in the absorption and/or synthesis of cholesterol, which might result from the changes in cecal fermentation, and by an increase in the fecal excretion of lipid, cholesterol and bile acid (Kim and Shin, 1998). Moreover, Inulin and oligofructose belong to a class of carbohydrates known as fructans (Kaur and Gupta, 2002). Chicory fructans were shown to be prebiotic (selectively interacting with intestinal bacterial ecosystem) in humans and in animals, including livestock (pig, calf, horse, broiler, laying hen, and fish) and pets (Rumessen *et al.*, 1998; Van Loo, 2007). It was observed the blood glucose, blood urea nitrogen, and nonesterified fatty acids of dairy cows were not affected by chicory consumption for 12 weeks (Soder *et al.*, 2006).

The water-soluble antioxidant properties of chicory were evaluated *in vitro* as antioxidant activity and *ex vivo* as protective activity against rat liver cell (Gazzani *et al.*, 2000). In other study, the different fractions of alcoholic extract and one phenolic compound AB-IV of seeds of chicory were screened for antihepatotoxic activity on carbon tetrachloride -induced liver damage in albino rats. The degree of protection was measured using biochemical parameters like ALT, AST, ALP, and total protein. The histopathological study of the liver was carried out, wherein the methanolic fraction and compound AB-IV showed almost complete normalization of the tissues as neither fatty accumulation nor necrosis was observed (Ahmed *et al.*, 2003). Fallah Hussein *et al.* (2005) investigated the efficacy of herbal medicine Liv-52 (consisting of *Mandur basma*, *Tamarix gallica* and herbal extracts of *Capparis spinosa*, *Cichorium intybus*, *Solanum nigrum*, *Terminalia arjuna* and *Achillea millefolium*) on liver cirrhosis outcomes was compared with the placebo for 6 months in 36 cirrhotic patients referred to Tehran Hepatic Center. The outcome measures included child-pugh score, ascites, serum ALT, AST, total bilirubin, albumin, prothrombin time, platelet and white blood cells counts. The results demonstrated that the patients treated

with Liv-52 for 6 months had significantly better child-pugh score, decreased ascites, decreased serum ALT and AST (Fallah Hussein *et al.*, 2005). Esculetin, a phenolic compound found in chicory and *Bougainvillra spectabilis* was shown protective effect against paracetamol and CC14-induced hepatic damage and decreased serum ALT, AST and ALP levels in rats and mice (Gilani *et al.*, 1998). Cichotyboside, a sesquiterpene glycoside from the seeds of chicory exhibited a significant anti-hepatotoxic activity against CC14 induced toxicity in rats, wherein it reduced the elevated levels of liver enzymes such as ALT, AST and ALP; and it increased total protein and albumin (Aktay *et al.*, 2000; Ahmed *et al.*, 2008). However, in one study it was demonstrated that chicory extract did not have significant *in vitro* effect on the bilirubin level of neonates reported by the laboratory (Nassirian and Eslami, 2008).

CONCLUSION

chicory did not affect concentration of ALT, AST, ALP, LDH and uric acid in serum of horse in normal condition but may be suitable in pathological statuses and diseases.

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