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A Brief Focus on Hepatoprotective Leads from Herbal Origin

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Abstract: The diseases associated to liver, heart, blood, brain, kidneys, spleen, pancreas, nerves, hormones, fluids and electrolytes, virus, bacteria, protozoa, fungi etc. are paying much attention and numerous research work is been done in respective areas, worldwide metabolic disorders are need to pay an attention. Problems related to liver such as acute or chronic inflammation, toxin-/drug-induced hepatitis, cirrhosis and hepatitis are very common nowadays due to our exposure to different environmental pollutants like chemicals, toxins, viruses etc. For centuries, many herbal drugs and formulations have been used as natural remedies for the prevention and/or treatment of liver diseases and have been popularized world over by leading pharmaceuticals. Due to insufficient scientific-based pharmacological data, most of the herbal formulations cannot be recommended for the treatment of liver diseases. In this review article, an attempt has been made to focus a brief view on few herbal hepatoprotective leads that may be useful to the health professionals, scientists and scholars working the field of pharmacology and therapeutics to develop evidence-based alternative medicine to cure different kinds of liver dysfunctions.

Key words: Liver toxicity, part of plant, plant extract

INTRODUCTION

Health related problems are on high today. As we know that the diseases associated to liver, heart, blood, brain, kidneys, spleen, pancreas, nerves, hormones, fluids and electrolytes, virus, bacteria, protozoa, fungi etc. are paying much attention and numerous research work is been done in respective areas, worldwide metabolic disorders are need to pay an attention.

It is well known that liver is one of the most important organs in the biotransformation of food, drugs, endogenous and exogenous substances. Profuse supply of blood and the presence of many redox systems (e.g., cytochromes and various enzymes) enable liver to convert these substances into different kinds of inactive, active or even toxic metabolites. Problems related to liver such as acute or chronic inflammation, toxin-/drug-induced hepatitis, cirrhosis and hepatitis are very common nowadays due to our exposure to different environmental pollutants like chemicals, toxins and viruses etc. (Dhiman and Chawla, 2005).

HERBAL LEADS AS HEPATOPROTECTIVE

Now a days liver diseases due to exposure of different drug molecules are very common (Ansari, 2010). An attention must to be paid to cure the hepatic disorders. The mainstay of treatment is supportive care, with careful monitoring for signs of acute liver failure or progression to chronic liver disease (Ansari *et al*., 2009).

The use of plants, plant extracts or plant-derived pure chemicals to treat disease is a therapeutic modality, which has stood the test of time. Traditional or herbal medicine is in an evolutionary process as communities and individuals continue to discover new techniques that can transform practices in the field of medical sciences. Traditional medicine and drug discovery using natural products still important issues in the current target-rich, lead-poor scenario. According to the World Health Organization (WHO), about three-quarters of the world population depends upon traditional remedies (mainly herbs) for the health care of its people. In fact, herbs/plants are the oldest friends of human being. They not only provided food and shelter but also served the humanity to cure different dysfunctions. The traditional medicines also sometime called as, herbal or natural medicine existed in one way or another in different cultures/civilizations, such as Egyptians, Western, Chinese, Kampo (Japan) and Greco-Arab or Unani/Tibb (South Asia) (Ansari and Inamdar, 2010). A number of herbs are traditionally used in different countries during

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hepatic disorders and new search is going on to isolate the active hepatoprotective principle from these herbs (Dhiman and Chawla, 2005).

In India, more than 87 plants are used in 33 patented and proprietary multi-ingredient plant formulations (Handa *et al*., 1986). Handa and his group reported that about 170 phytoconstituents isolated from 110 plants belonging to 55 families were stated to possess liver protective activity about 600 commercial herbal formulations with claimed hepatic protective activity are being marketed worldwide (Trease and Evans, 2002). Several hundred plants have been examined for use in a wide variety of liver disorders. Just a handful has been fairly well researched. The latter category of plants include: *Silybum marianum* (milk thistle), *Picrorhiza kurroa* (kutkin), *Curcuma longa* (turmeric), *Camellia sinensis* (green tea), *Chelidonium majus*(greater celandine), *Glycyrrhiza glabra* (licorice) and *Allium sativa* (garlic). (Luper, 1998). Some complex Chinese herbal formulae, such as Pro-liver Pill (Yanggan Wan) (Yang *et al*., 2000) Liver Care (Himalaya Drug Co., Bangalore, India), Liv-52 (Huseini *et al*., 2005) Jianpi Wenshen Pill (Jianpi Wenshen Wan) (Song, 1994) Binggan capsules (Binggan Jiaonang) (Han *et al*., 1997) Binggan Tang (Pei *et al*., 1996) Yizhu decoction (Yizhu Koufuye) (Jiang, 1999), Yiergan Tang (Yu, 1995) and Xiaochaihu Tang (Sho-saiko-to or SST) (Yamashiki *et al*., 1997) have been reported to have significant therapeutic effects on liver protection or treatment of liver diseases.

Table 1: Hepatoprotective herbal leads

Herbal leads	Part	Extract	Drug to induce liver damage
Silymarin (Milk Thistle)	Seed	Petroleum	Acetaminophen, Alcohol (Dhiman and Chawla, 2005)
Zanthoxylum piperitum DC	Fruit	Methanol	Hypoxanthine/ Xanthine oxidase glucose (Lee and Lim, 2008)
Lactuca indica L.	Aerial parts	Methanol	Human HBV-transfected liver cell line Hep G2.2.15 (Kim *et al*., 2007)
Solanum nigrum L.	Whole plant	Aqueous	Carbon tetra chloride (Lin *et al*., 2008)
Fumaria indica Pugsley	Whole plant	Ethanol	d-galactosamine (Rathi *et al*., 2007)
Hypericum japonicum	Whole plant	Aqueous	Carbon tetrachloride and Alpha-naphthyl isothiocyanate (Wang *et al*., 2008)
Picorrhiza kurroa	Whole plant	Ethanol	2-acetylaminofluorene (Rahman, Sultana, 2007)
Macelignan (*Myristica fragrans* H.)	Fruit	Methanol	Cisplatin (Sohn *et al*., 2008)
Piper chaba S.	Fruit	Methanol	d-galactosamine/TNF-alpha (Matsuda *et al*., 2008)
Cirsium setidens N.	Leaves and	n-butanol	Carbon tetra chloride (Lee *et al*., 2008a)
Cuscuta chinensis	Whole plant	Ethanolic	Acetaminophen (Yen *et al*., 2008)
Bideus pilosa L.	Whole plant	Methanol	Carbon tetra chloride (Yuan *et al*., 2008)
Cryptomeria	Wood	Methanol	Carbon tetra chloride (Shyur *et al*., 2008)
Green tea	Leaf	Aqueous	Ethanol (Lee *et al*., 2008b)
Cirsium setidens	Leaf	Methanol	d-galactosamine (Yoo *et al*., 2008)
Careya arborea	Bark	Methanol	Ehrlich ascites carcinoma (Senthilkumar *et al*., 2008)
Ganoderma lucidum	Whole plant	Methanol	d-galactosamine (Shi *et al*., 2008)
Leucophyllum frutescens	Whole plant	Methanol	Carbon tetra chloride (Balderas-Renteria *et al*., 2007)
Pneraria lobata	Root	Methanol	Carbon tetra chloride (Hwang *et al*., 2007)
Phyllanthus polyphyllus	Fruit	Methanol	Acetaminophen (Rajkapoor *et al*., 2008)
Phyllanthus rheedii Wight.	Fruit	Ethanol	d-galactosamine (Suresh and Asha, 2008)
Alisma orieutale	Rhizome	Methanol	Bromobenzene (Hur *et al*., 2007)
Acanthopanax	Whole plant	Methanol	d-galactosamine/ lipopolysaccharide (Nan *et al*., 2008)
Cyperus scariosns	Tubers	Aqueous-	Acetaminophen and Carbon tetra chloride (Gilani and Janbaz, 1995)
Hedyotis corymbosa	Whole plant	Methanol	Paracetamol (Sini *et al*., 2006)
Azadirachta indica	Leaf	Ethanol	Paracetamol (Chattopadhyay, 2003)
Operculina turpethum Linn.	Root	Ethanol	Paracetamol (Suresh *et al*., 2006)
Azadirachta indica	Leaf	Ethanol	Paracetamol (Chattopadhyay and Bandyopadhyay, 2005)
Rumex patientia	Root	Ethanol	Fe- NTA (Ferric nitrilo tri acetate) (Lone *et al*., 2007)
Cassia occideutalis L.	Leaf	Aqueous	Paracetamol and Ethyl alcohol (Jafri *et al*., 1999)
Hibiscns sabdariffa	Flower	Aqueous	Azathioprine (Amin and Hamza, 2005)
Rosmarinusofficinalis	Leaf	Aqueous	Azathioprine (Amin and Hamza, 2005)
Salvia officinalis	Leaf	Aqueous	Azathioprine (Amin and Hamza, 2005)
Calotropis procera	Latex	Aqueous	Carbon tetra chloride (Padhy *et al*., 2007)
Phyllanthus emblica L.	Fruit	Ethanol	Ethanol (Pramyothin *et al*., 2006)
Crataeva nurvala	Bark	Methanol	Aflatoxin B1 (Preetha *et al*., 2006)
Aronia melanocarpa	Fruit	Aqueous	Indomethacin (Valcheva-Kuzmanova *et al*., 2005)
Thunbergia laurifolia L.	Leaf	Aqueous	Ethanol (Pramyothin *et al*. 2005)
Trichilia emetica Vahl.	Root	Aqueous	Carbon tetra chloride (Germano *et al*., 2005)
Azadirachta indica	Fruit	Aqueous	Paracetamol (Chattopadhyay and Bandyopadhyay, 2005)
Trigonella foenum graecum	Seed	Methanol	Ethanol (Kaviarasan and Anuradha, 2007)
Glycerrhiza glabra	Root	Aqueous	Acute hepatic patient, Hepatitis patient (Dhiman and Chawla, 2005)
Picrorrhiza rhizoma	Rhizome	Aqueous	Carbon tetra chloride (Lee *et al*., 2007)
Andrographis lineata	Leaf	Aqueous	Carbon tetra chloride (Sangameswaran, *et al*., 2008)
Jigrine Tablet	Formulation	Aqueous	Thioacetamide (Aftab *et al*., 2007)
Kamilari Tablets	Formulation	Aqueous	Carbon tetra chloride (Rajesh and Latha, 2004)
Live52 Tablets	Formulation	Methanol	Carbon tetra chloride (Huseini *et al*., 2005)

In experimental hepatotoxicity models in laboratory or higher animals, a large number of herbals exerted hepatoprotective/curative effects that warrant their clinical testing (Table 1).

A lot of herbal drugs and formulations are on the market to support health, relieve symptoms and cure diseases and at least one quarter of patients with liver diseases use ethnic drugs. But most of these products lack scientific pharmacological validation. More efforts need to be emphasised towards methodological scientific evaluation for their safety and efficacy by subjecting to vigorous pre-clinical studies followed by clinical trials to put forward. This approach will help to evaluate the genuine therapeutic value of these natural pharmacotherapeutic agents and standardized the dosage regimen on evidence-based findings to become more than a fashionable trend. Due to insufficient scientific-based pharmacological data, most of the herbal formulations cannot be recommended for the treatment of liver diseases (Stickel and Schuppan, 2007).

In spite of the availability of more than 300 preparations for the treatment of jaundice and chronic liver diseases in Indian Systems of Medicine (using more than 87 Indian medicinal plants,) only four terrestrial plants have been scientifically elucidated while adhering to the internationally acceptable scientific protocols. *Sylibum marianum* have been proved to be anti-oxidative, anti-lipid peroxidative, antifibrotic, anti-inflammatory, immunomodulating and liver regenerative. *Glycyrrhiza glabra* has been reported to be hepatoprotective and capable of inducing an endogenous interferon. *Picrorhiza kurroa* is proved to be anti-inflammatory, hepatoprotective and immunomodulatory potential. In-depth studies on *Phyllanthus amarus* have confirmed this plant preparation possessed antiviral against hepatitis B and C viruses, hepatoprotective and immunomodulating effects, besides anti-inflammatory properties (Thyagarajan *et al*., 2002).

Treating liver dysfunction with plant-derived compounds which are accessible and do not require laborious pharmaceutical synthesis appeals to look at it. In this review article, other than a brief introduction of liver, an attempt has been made to compile briefly some reported hepatoprotective plants from India and abroad and may be useful to the health professionals, scientists and scholars working the field of pharmacology and therapeutics to develop evidence-based alternative medicine to cure different kinds of liver dysfunctions.

REFERENCES

Aftab, A., K.K. Pillai and K. Abdul, 2007. Hepatoprotective effect of jigrine. J. Ethnopharmacol., 79: 35-35.

Amin, A. and A.A. Hamza, 2005. Hepatoprotective effects of hibiscus, rosmarinus and salvia on azathioprine-induced toxicity in rats. Life Sci., 77: 266-278.

Ansari, J.A., A.M. Khan and M.B. Anwar, 2009. Liver toxicity caused by synthetic drugs. J. Chem. Pharm. Sci., 2: 265-269.

Ansari, J.A., 2010. Therapeutic approaches in management of drug-induced hepatotoxicity. J. Biol. Sci., 10: 386-395.

Ansari, J.A. and N.N. Inamdar, 2010. The promise of traditional medicines. Int. J. Pharmacol., 6: 808-812.

Balderas-Renteria, I., M.R. Camacho-Corona, P. Carranza-Rosales, H.G. Lozano-Garza, D. Castillo-Nava, F.J. Alvarez-Mendoza and E.M. Tamez-Cantu, 2007. Hepatoprotective effect of *Leucophyllum frutescens* on Wistar albino rats intoxicated with carbon tetrachloride. Ann. Hepatol., 6: 251-254.

Chattopadhyay, R.R., 2003. Possible mechanism of hepatoprotective activity of Azadirachta indica leaf extract: Part II. J. Ethnopharmacol., 89: 217-219.

Chattopadhyay, R.R. and M. Bandyopadhyay, 2005. Possible mechanism of hepatoprotective activity of Azadirachta indica leaf extract against paracetamol-induced hepatic damage in rats: Part III. Indian J. Pharmacol., 37: 184-185.

Dhiman, R.K. and Y.K. Chawla, 2005. Herbal Medicines for liver diseases. Digestive Dis. Sci., 10: 1807-1812.

Germano, M.P., V. D'Angelo, R. Sanogo, S. Catania, R. Alma, R. De Pasquale and G. Bisignano, 2005. Hepatoprotective and Antibacterial effects of *Trichilia emetica* Vahl. (Meliaceae). J. Ethnopharmacol., 96: 227-232.

Gilani, A.U. and K.H. Janbaz, 1995. Studies on protective effect of Cyperus scariosus extract on acetaminophen and CCl4 induced hepatotoxicity. General Pharmacol., 26: 627-631.

Han, G.P., Z.Y. Wang and S.L. Peng, 1997. Binggan capsule combined with interferon for treatment of 30 cases of hepatitis C. Henan Zhongyi, 12: 43-44.

Handa, S.S., A. Sharma and K.K. Chakraborti, 1986. Natural products and plants as liver protecting drugs. Fitoterapia, 57: 307-351.

Hur, J.M., J.W. Choi and J.C. Park, 2007. Effects of methanol extract of *Alisma orientale* rhizome and its major component, alisol B 23-acetate, on hepatic drug metabolizing enzymes in rats treated with bromobenzene. Arch. Pharm. Res., 30: 1543-1549.

Huseini, F., S.M. Alavian, R. Heshmat, M.R. Heydari and K. Abolmaali, 2005. The efficacy of Liv-52 on liver cirrhotic patients: A randomized, double-blind, placebo-controlled first approach. Phytomedicine, 12: 619-624.

Hwang, Y.P., C.Y. Choi, Y.C. Chung, S.S. Jeon and H.G. Jeong, 2007. Protective effects of puerarin on carbon tetrachloride-induced hepatotoxicity. Arch. Pharm. Res., 30: 1309-1317.

Jafri, M.A., M.J. Subhani, K. Javed and S. Singh, 1999. Hepatoprotective activity of leaves of Cassia occidentalis against paracetamol and ethyl alcohol intoxication in rats. J. Ethnopharmacol., 66: 355-361.

Jiang, Y.H., 1999. Treatment of 20 cases of hepatitis C using a self-prescribed yizhu oral liquid. Nanjing Zhongyiyao Daxue Xuebao, 15: 256-256.

Kaviarasan, S. and C.V. Anuradha, 2007. Fenugreek (*Trigonella foenum graecum*) seed polyphenols protect liver alcohol toxicity: A role on hepatic detoxification system and apoptosis. Pharmazi, 62: 299-304.

Kim, K.H., Y.H. Kim and K.R. Lee, 2007. Isolation of quinic acid derivatives and flavonoids from the aerial parts of Lactuca indica L. and their hepatoprotective activity *in vitro*. Bioorg. Med. Chem. Lett., 17: 6739-6743.

Lee, H.S., K.Y. Keum and S.K. Ku, 2007. Effects of *Picrorrhiza rhizoma* water extracts on the subacute liver damages induced by carbon tetrachloride. J. Med. Food, 10: 110-117.

Lee, S.H., S.I. Heo, L. Li, M.J. Lee and M.H. Wang, 2008a. Antioxidant and hepatoprotective activities of *Cirsium setidens* NAKAI against CCl (4)-induced liver damage. Am. J. Chin. Med., 36: 107-114.

Lee, S.I., H.J. Kim and Y.C. Boo, 2008b. Effect of green tea and (-)-epigallocatechin gallate on ethanol-induced toxicity in HepG2 cells. Phytother. Res., 22: 669-674.

Lee, S.J. and K.T. Lim, 2008. Glycoprotein of *Zanthoxylum piperitum* DC has a hepatoprotective effect via anti-oxidative character *in vivo* and *in vitro*. Toxicol. In Vitro, 22: 376-385.

Lin, H.M., H.C. Tseng, C.J. Wang, J.J. Lin, C.W. Lo and F.P. Chou, 2008. Hepatoprotective effects of *Solanum nigrum* Linn extract against CCl4-iduced oxidative damage in rats. Chem. Biol. Interact., 171: 283-293.

Lone, I.A., G. Kaur, M. Athar and M.S. Alam, 2007. Protective effect of *Rumex patentia* (English Spinach) roots on ferric nitrilotriacetate (Fe-NTA) induced hepatic oxidative stress and tumor promotion response. Food Chem. Toxiol., 45: 1821-1829.

Luper, N.D.S., 1998. A review of plants used in the treatment of liver disease: Part 1. J. Alter. Med. Rev., 3: 410-421.

Matsuda, H., K. Ninomiya, T. Morikawa, D. Yasuda, I. Yamaguchi and M. Yoshikawa, 2008. Protective effects of amide constituents from the fruit of Piper chaba on D-galactosamine/TNF-alpha-induced cell death in mouse hepatocytes. Bioorg. Med. Chem. Lett., 18: 2038-2042.

Nan, J.X., X.J. Jin, L.H. Lian, X.F. Cai, Y.Z. Jiang, H.R. Jin and J.J. Lee, 2008. A diterpenoid acanthoic acid from *Acanthopanax koreanum* protects against D-galactosamine/lipopolysaccharide-induced fulminant hepatic failure in mice. Biol. Pharm. Bull., 31: 738-742.

Padhy, B.M., A. Srivastava and V.L. Kumar, 2007. *Calotropis procera* latex affords protection against carbon tetrachloride induced hepatotoxicity in rats. J. Ethnopharmacol., 113: 498-502.

Pei, Z.G., Y.L. Liu and S.M. Zhao, 1996. Therapeutic observation on Binggan decoction combined with interferon in treating 46 cases of hepatitis C. Shiyong Zhongxiyi Jiehe Linchuang, 9: 444-444.

Pramyothin, P., H. Chirdchupunsare, A. Rungsipipat and C. Chaichantipyuth, 2005. Hepatoprotective activity of *Thunbergia laurifolia* Linn extract in rats treated with ethanol: *In vitro* and *In vivo* studies. J. Ethnopharmacol., 102: 408-411.

Pramyothin, P., P. Samosorn, S. Poungshompoo and C. Chaichantipyuth, 2006. The protective effects of *Phyllanthus emblica* Linn. extract on ethanol induced rat hepatic injury. J. Ethnopharmacol., 107: 361-364.

Preetha, S.P., M. Kanniappan, E. Selvakumar, M. Nagaraj and P. Varalakshmi, 2006. Lupeol ameliorates aflatoxin B-1-induced peroxidative hepatic damage in rats. Comp. Biochem. Physiol. C Toxicol. Pharmacol., 143: 333-339.

Rahman, S. and S. Sultana, 2007. Protective effects of *Picorrhiza kurroa* extract against 2-acetylaminofluorene-induced hepatotoxicity in Wistar rats. J. Environ. Pathol. Toxicol. Oncol., 26: 195-205.

Rajesh, M.G. and M.S. Latha, 2004. Preliminary evaluation of the antihepatotoxic activity of Kamilari, a polyherbal formulation. J. Ethnopharmacol., 91: 99-104.

Rajkapoor, B., Y. Venugopal, J. Anbu and N. Harikrishnan, 2008. Protective effect of *Phyllanthus polyphyllus* on acetaminophen induced hepatotoxicity in rats. Pak. J. Pharm. Sci., 21: 57-62.

Rathi, A., A.K. Srivastava, A. Shirwaikar, A.K.S. Rawat and S. Mehrotra, 2007. Hepatoprotective potential of *Fumaria indica* Pugsley whole plant extracts, fractions and an isolated alkaloid protopine. Phytomedicine, 15: 470-477.

Sangameswaran, B., T.C. Reddy and B. Jayakar, 2008. Hepatoprotective effect of leaf extracts of *Andrographis lineata* nees on liver damage caused by carbon tetrachloride in rats. Phytother. Res., 22: 124-126.

Senthilkumar, N., S. Badami, S.H. Dongre and S. Bhojraj, 2008. Antioxidant and hepatoprotective activity of the methanol extract of *Careya arborea* bark in Ehrlich ascites carcinoma-bearing mice. J. Nat. Med., 62: 336-339.

Shi, Y., J. Sun, H. He, H. Guo and S. Zhang, 2008. Hepatoprotective effects of *Ganoderma lucidum* peptides against D-galactosamine-induced liver injury in mice. J. Ethnopharmacol., 117: 415-419.

Shyur, L.F., C.C. Huang, C.P. Lo, C.Y. Chiu, Y.P. Chen, S.Y. Wang and S.T. Chang, 2008. Hepatoprotective phytocompounds from *Cryptomeria japonica* are potent modulators of inflammatory mediators. Phytochem., 69: 1348-1358.

Sini, S., P.G. Lathab, J.M. Sasikumara, S. Rajashekaranb, S. Shyamal and V.J. Shine, 2006. Hepatoprotective studies on *Hedyotis corymbosa* (L.) Lam. J. Ethnopharmacol., 106: 245-249.

Sohn, J.H., K.L. Han, J.H. Kim, Y. Rukayadi and J.K. Hwang, 2008. Protective effects of macelignan on cisplatin-induced hepatotoxicity is associated with JNK activation. Biol. Pharm. Bull., 31: 273-277.

Song, Y.W. and Y.Z. Song, 1994. Observation of Chinese herbal treatment based on spleen and kidney on asymptomatic carriers of hepatitis B virus. Zhejiang Zhongyi Zazhi, 12: 487-488.

Stickel, F. and D. Schuppan, 2007. Herbal medicine in the treatment of liver diseases. Dig. Liver Dis., 39: 293-304.

Suresh, K.S.V., C. Sujatha, J. Syamala, B. Nagasudha and S.H. Mishra, 2006. Protective effect of root extract of *Operculina turpethum* L. against paracetamol-induced hepatotoxicity in rats. Indian J. Pharm. Sci., 68: 32-35.

Suresh, V. and V.V. Asha, 2008. Preventive effect of ethanol extract of *Phyllanthus rheedii* Wight. on D-galactosamine induced hepatic damage in Wistar rats. J. Ethnopharmacol., 116: 447-453.

Thyagarajan, S.P., S. Jayaram, V. Gopalakrishnan, R. Hari, P. Jeyakumar and M.S. Sripathi, 2002. Herbal medicines for liver diseases in India. J. Gastroenterol. Hepatol., 17: S370-S376.

Trease, G.E. and W.C. Evans, 2002. Pharmacognosy. 15th Edn., WB Saunders, London, ISBN: 8131200876, pp: 406.

Valcheva-Kuzmanova, S., K. Marazova, I. Krasnaliev, B. Galunska, P. Borisova and A. Belcheva, 2005. Effect of *Aronia melanocarpa* fruit juice on indomethacin-induced gastric mucosal damage and oxidative stress in rats. Exp. Toxicol. Pathol., 56: 385-392.

Wang, N., P. Li, Y. Wang, W. Peng and Z. Wu *et al*., 2008. Hepatoprotective effect of *Hypericum japonicum* extract and its fractions. J. Ethnopharmacol., 116: 1-6.

Yamashiki, M., A. Nishimura, H. Suzuki, S. Sakaguchi and Y. Kosaka, 1997. Effects of the Japanese herbal medicine Sho-saiko-to (TJ-9) on *in vitro* interleukin-10 production by peripheral blood mononuclear cells of patients with chronic hepatitis C. Hepatology, 25: 1390-1397.

Yang, M., K. Chen and J.C. Shih, 2000. Yang-Gan-Wan protect mice against experimental liver damage. Am. J. Chin. Med., 28: 155-162.

Yen, F.L., T.H. Wu, L.T. Lin, T.M. Cham and C.C. Lin, 2008. Nanoparticles formulation of Cuscuta chinensis prevents acetaminophen-induced hepatotoxicity in rats. Food Chem. Toxicol., 46: 1771-1777.

Yoo, Y.M., J.H. Nam, M.Y. Kim, J. Choi and H.J. Park, 2008. Pectolinarin and pectolinarigenin of Cirsium setidens prevent the hepatic injury in rats caused by D-galactosamine via an antioxidant mechanism. Biol. Pharm. Bull., 31: 760-764.

Yu, W., 1995. Yi Er Gan decoction for treatment of 40 cases of hepatitis C. Xin Zhongyi, 27: 46-47.

Yuan, L.P., F.H. Chen, L. Ling, P.F. Dou, H. Bo, M.M. Zhong and L.J. Xia, 2008. Protective effects of total flavonoids of *Bidens pilosa* L. (TFB) on animal liver injury and liver fibrosis. J. Ethnopharmacol., 116: 539-546.