IJPSR (2019), Volume 10, Issue 1 **(Review Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 11 April 2018; received in revised form, 05 July 2018; accepted, 13 July 2018; published 01 January 2019

MEDICINAL PLANTS WITH ANTI-ULCER AND HEPATOPROTECTIVE ACTIVITY: A REVIEW

Chandana Majee [*1], Rupa Mazumder [1] and Alka N. Choudhary [2]

Institute of Pharmacy [1], NIET, Greater Noida - 201306, Uttar Pradesh, India.
SGRR Institute of Technology & Science [2], Dehradun - 248121, Uttarakhand, India.

Keywords:

Hepatoprotective activity, Antiulcer activity, The natural remedy, Flavonoids

Correspondence to Author:
Chandana Majee

Associate Professor,
Institute of Pharmacy,
NIET, Greater Noida - 201306,
Uttar Pradesh, India.

E-mail: cmchandana1@gmail.com

ABSTRACT: Nature gives numbers of drugs and possibly has all solutions for human diseases. Till date, nature provides a large number of clinically useful drugs. Ulcer and liver diseases are major increasing health problems. Now a day number of drugs are used for the treatment of peptic ulcer and hepatic diseases, but these drugs have various types of side effect such as incidences of relapse, and drug interactions. Drugs of plant origin gaining popularity to treat peptic ulcer and hepatotoxicity. It is difficult to search pure phytochemicals as hepatoprotective and antiulcer drugs. It is time-consuming and also very expensive. From authentic literature sources, it founded that there are no medicinal plants, which utilized for the treatment of ulcer and liver diseases. *Andrographis paniculata*, *Eclipta alba*, *Picrorrhiza kurroa*, *Silibum marianum*, *Phyllanthus* and *Trichopus zeylanicus*, *etc*. plants are renounced for their satisfactory activity against certain hepatotoxins. The wide range of compounds showing anti-ulcer and hepatoprotective effect, among them flavonoids is most important. Flavonoids play an important role in reducing free radicals. Various isolated compounds like apigenin, sylimarin, genistein, quercetin, kaempherol, catechins and so on show the significant result as hepatoprotective and anti-ulcer drugs. From this review article, we can conclude that no. of medicinal plants and their active chemical constituent are responsible for anti-ulcer and hepatoprotective effect. Among the all chemical constituents flavonoids also playing an important role.

INTRODUCTION: Peptic ulcer and liver diseases are serious health problems nowadays. In our body liver play the key role in metabolism, secretion and storage [1]. Due to the liver disorder, about 20000 deaths are found every year due to liver disorders and as a consequence of peptic ulcer about 15000 deaths occur each year. Hepatocellular carcinoma is most common [2, 3].

QUICK RESPONSE CODE

DOI:
10.13040/IJPSR.0975-8232.10(1).1-11

The article can be accessed online on
www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.10(1).1-11

In general, hepatotoxic chemicals engender some reactive species, which form a covalent bond with the lipid which is responsible for damage liver cells [4]. An ulcer is mostly a swollen break in the skin or the mucous membrane present in the lining of the alimentary tract.

The main cause of peptic ulcer is the increase acids secretion and disturbance of the normal equilibrium either caused by enhanced diminish or aggression in mucosal resistance. Other causes of peptic ulcer are a bacterial infection (*H. pylori*), long-term uses of painkiller such as ibuprofen, naproxen sodium, *etc*., stress and spicy food habit [5]. Hydrochloric corrosive and pepsin harm the mucous film of the gastrointestinal tract as the outcome both gastric

and duodenal ulcers happen. Ulcers, for the most part, extend between 3 mm and a few centimeters in measurement [6]. Duodenal ulcers are more common in adult males. Gastric ulcers happen commonly at old age person and in the middle class of people. Peptic ulceration occurs in those areas where acid secretion is generally more [7].

In the human body, the liver is the largest organ. The basic rote of liver is control of different physiological procedures like metabolisms of carbohydrate, various type of fat, protein. It also plays an important role in detoxification, bile acid secretion which is important for digestion and storage of vitamin. Along these lines, to keep up a healthy liver is most vital for a healthy human. As a result of these functions, hepatic illnesses are the chief threat to general wellbeing, and nowadays hepatitis is widespread diseases [10]. There are various reasons for liver diseases. They may be as follows [11, 12, 13].

1. Too much interpretation of harmful chemicals.
2. An excessive amount of free radical suppress the natural defensive system in our body and also damage the hepatic cell, reason of cirrhosis, jaundice and fatty liver.
3. Intense harming with carbon tetrachloride causes fast lipid deposition before necrosis becomes evident.
4. There is no hazardous chemical which reduces the antioxidant activity of enzyme-like glutathione peroxidase, catalase, superoxide dismutase and so on.

The most of the liver diseases are classified as follows: [14]

a. Fatty liver diseases
b. Hepatosis (caused by the viral infection)
c. Cirrhosis
d. Liver cancer

By trials and errors, the ancient people used herbs for relieving their health problems in very primitive ways [15]. The treatment alternatives for normal liver infections and ulcers are limited due to the lack of hepatoprotective and antiulcer drugs in allopathic medicines [16, 17].

For the development of new drugs for the treatment of hepatic and ulcer disease, various screening models are available [18-22]. The various screening models are given in **Table 1**.

TABLE 1: SCREENING MODELS FOR ANTI ULCER AND HEPATOPROTECTIVE ACTIVITY

Antiulcer activity	Hepatoprotective activity
• Hydrochloric acid induced ulcers • Ulcers caused by histamine-induced • Ulcers caused by Acetic acid-induced • Ethanol-induced ulcers • Aspirin-induced ulcers • Ulcer cause by giving water immersion stress • Pylorus ligation induced ulcers • Ulcer cause by reserpine-induced • Indomethacin-induced ulcers • Serotonin-induced ulcer	• Paracetamol (acetaminophen) induced hepatotoxicity • CCl_4 induced hepatotoxicity • Alcohol and carbon tetrachloride induced hepatotoxicity • Carbon tetrachloride and paraffin induced hepatotoxicity • Hepatotoxicity caused by giving d-galactosamine/ lipopolysaccharide • Thioacetamide induced hepatotoxicity • Hepatotoxicity caused by giving Antitubercular drugs

Liver Diseases, Ulcer, and Medicinal Plants: Synthetic hepatotoxic chemicals generally damage liver by inducing lipid peroxidation and other oxidative free radical [23].

***Andrographis paniculata*:** *Andrographis paniculata* (AP) is an important medicinal herb generally called the "King of Bitters." One of the most active isolated compounds forms AP andrographolide, a bicyclic diterpenoid lactone. Andrographolide used in autoimmune disorders such as ulcerative colitis.

AP also plays a major role as hepatoprotective drugs. By sowing the experiment result it cleared that intraperitoneal (i.p.) administration of the AP extract 62.5, 125, 250, and 500 mg/kg body weight in the ethanol-induced hepatic model the drug was very effective. Farther from the biochemical investigation it gives the clear indication that AP extract can reduce in the of AST, ALT, ALP, ACP and LP levels in the liver and kidneys. From the above result, it concluded that *A. paniculata* protects the liver against ethanol-induced liver toxicity by reducing the rate of lipid peroxidation and increasing the antioxidant defense mechanism in rats [24, 25].

***Eclipta alba*:** It is a perennial shrub mostly found in moist tropical countries. *Eclipta alba* (L.) generally contains alkaloids, flavonoids, glycosides, polyacetylenes, triterpenoids. Aerial part contains no of flavonoids such as Apigenin, Luteolin-7-0-glucoside various type of triterpene like *β*-amyrin and, cinnaroside, sulphur compounds, eclalba-saponins I-VI. The *Eclipta alba* (EA) extract has a good effect on the hepatotoxic cause by paracetamol induced.

From the various experiments, it found that *E. alba* (ethanolic extract) show the effect on the paracetamol-induced hepatotoxic model in mice at various dosage forms like 100 mg and 250 mg/kg body weight weigh. This herbal extract has a significant role in normalizing the elevated serum transaminase levels which caused due to liver injury, lack of blood flow, *etc*. From the microscopic examination of tissue, it proved that the drug reduces in fatty deterioration and centrizonal necrosis [26, 27.]

***Picrorhiza kurroa*:** It is a very common herb in the Indian traditional Ayurveda medicine. From the various literature survey, it found that *Picrorhiza kurro* has used as a vital medicine for liver disorder and it used as very significant ingredient for many Ayurvedic formulations for the treatment of liver toxicity. From the deferent study, it was found *P. kurroa* posses very good antioxidant properties [28]. From the experiment, it cleared that drug reduces the glutathione level and activates the enzyme which is helpful for antioxidant activity such as glutathione peroxidase. *Picrorhiza kurroa* extract treated rat group (antitubercular drug-induced model) for 50 mg/kg body weight for 50 days, give the significant result to normalize the elevated body serum level.

***Phyllanthus niruri*:** *Phyllanthus niruri* L**.** belongs to the family Euphorbiaceae utilized as a part of conventional medicine to treat an ulcer. *Phyllanthus niruri leaves extract* (ethanol*)* give the significant result on ulcer causes by ethanol-induced model. This plant extract at the dosage 200 mg and 400 mg/kg body wt gives the best result. The methanolic and aqueous extracts of *P. niruri* fruits are also very effective in inhabit the lipid peroxidation level. Fruit extract is very effective in normalizing the elevated enzyme level such as glutamate pyruvate transaminase carbon tetrachorired, glutamate oxaloacetate transaminase, *etc*. in carbon tetrachloride-induced ulcer model [32].

Trichopus zeylanicus: *Trichopus zeylanicus* belong to the family Dioscoraceae, is a small, rare herbaceous plant generally found from tropical forests of Malaysia, Sri Lanka and southern India. In Ayurvedic system of medicine *Trichopus, zeylanicus* is generally used as immune boost up medicine. In ancient time people used *Trichopus zeylanicus* for relieving from ulcer, liver disorder and for improving sexual performance. From the phytochemical study, it was found that methanolic extract of *Trichopus zeylanicus* gives the positive result for the presence of, alkaloids, flavonoids, steroids, triterpenoid saponins, *etc*. From the experiment, it was found that this plant leaves extract (100 mg per kg body weight) and leaves suspension (1000 mg per kg body weight) both are very affecting to reduce the elevated body serum level in rat ulcer caused by paracetamol administration. Histopathological study of rat group treated by *T. zeylanicus* gives positive result [33, 34].

***Schouwia thebica*:** From the various study it was cleared that *Schouwia thebica* extracts play the important role as a hepatoprotective drug. Various solvent extracts of *S. thebica* webb introduced to rats, as a hepatoprotective drug. As a result, it was found that these extracts effectively normalize the elevated body serum level [35].

***Syzygium aromaticum* L:** The herbal drug *Syzygium aromaticum* L. (Family Myrtaceae) generally called as clove used as flavoring agents. Reported chemical constituents present in this plant are tannins, sterols, triterpenes, flavonoids. From the different literature survey, it was found an *n*-butanol extract of dried flower buds of clove is very effective for the treatment of ulcer and gastric disorder in rats [36]. From the father study, it was clear that the ulcer activity of this plant is due to the one of the main ingredient eugenol. The pharmacological study suggests, eugenol stimulate the synthesis of mucus; as a result, the mucus layer became thick. Thus the eugenol act as gastroprotective drug [37].

Zingiber officinale: *Zingiber officinale* Roscoe (Ginger) is a very potent Indian medicinal herb

medicine very renounce treatment of gastrointestinal tract disorder. This herb is also famous for treatment for diarrhea nausea vomiting and dyspepsia. In ayurvedic system of medicine, Ginger is commonly used as antispasmodic, aromatic, and for prevention of gas formation in [38]. It found that if we compare the effect ginger extract (hydroalcoholic) with dose (100, 350, 700 mg/kg) with standard drug ranitidine (50 mg/kg), it gives the positive result. As a result, larger doses of extract (350 and 700 mg/kg) were effective to the ulcer.

There are some of the medicinal plants which are commonly used as the liver disorder. In this review, we have systematically arranged all the medicinal plants which are very effective to reduce the hepatic disorder in a various animal model. Here we also mention which part of the plants is more effective **Table 2**.

TABLE 2: MEDICINAL PLANTS HAVING HEPATOPROTECTIVE ACTIVITY

S. no.	Name of the plant	Part used	Extraction solvent	Chemical constituent	Animal model	Hepatotoxic agent
1	*Aerva lana* (Amaranthaceae) [40, 41]	Leaf and root	Aqueous alcoholic extract	Sitosteryl palmitate, hentriacontane, beta–sitosterol, D-glocoside	Rat	Paracetamol
2	*Artemisia capillaris* (Asteraceae) [42]	Whole plants	Aqueous ethanol extract	Eupatolin, arcapallin, capillartemisina, capillartemisin B 5, 2, 4-trihydroxy 6, 7, 5 Trimethoxyflavone	Rat	Carbon tetrachloride
3	*Aphanamixis polystachya* (Meliaceae) [43]	Leaves	Ethanolic extract	squalene, polyprenol, *β*-sitosterol, lutein, and *β*-carotene	Rat	Carbon tetrachloride
4	*Allium hirtifoli*um (Alliaceae) [44, 45]	Leaves	Hydro-alcoholic extract	Saponins, sapogenins, flavonoids including shallomin, quercetin and kaempferol, glycosidic flavonols	Rats	Alloxan
5	*Amorphophallus Paeoniifolius* Linn. (Araceae) [46]	Tuber	Methanol and aqueous extract	Carbohydrates, proteins, steroids and flavonoids	Rat	Paracetamol
6	*Allium sativum* (Alliaceae) [47, 48]	Bulbs	Ethanolic extract	Sapogenins, saponins, sulphuric compounds, and flavonoids, allicin	Rat	Cadmium
7	*Berberi vulgaris* (Berberidaceae) [49, 50]	Fruit	Methanolic extract	Alkaloids such as berbamine berberine, oxyacanthine, protoberbitone alkaloids palmatine, flavonoids	Rat	Carbon tetrachloride
8	*Calendula officinalis* (Asteraceae) [51]	Flower	Methanolic extract	Monoterpenoids such as α-thujene and T-muurolol, triterpenoid sesquiterpene, triterpene alcohols, and flavonol glycosides, flavonoids, saponins.	Albino Rat	Carbon tetrachloride
9	*Cercissili quastrum* (Leguminoseae) [52]	Whole plants	Hydro-alcoholic extract	Myricitoside, atractylon, diterpenoids, triterpenoids	Rat	Carbon tetrachloride
10	Citrullus *lanatus* (Cucurbitaceae) [53, 54]	Fruits	Methanolic extract	Alkaloids, triterpenes, anthraquinones, sterols, flavonoids, saponins, tannins, flavones aglycone, and simple phenols	Rat	Carbon tetrachloride

12	*Daucus carota* (Apiaceae) [55, 56]	Seeds	95% Methanolic extract	*D. carota* steroids, triterpenes, flavonoids	Wister rat	Lindane
13	*Decalepis hamiltonii* (Asclepiadaceae) [57, 58]	Roots	Aqueous extract	2-Hydroxy-4-methoxybenzaldehyde, p-Anisaldehyde, vanillin, borneol	Rat	Ethanol
14	*Eclipta alba* (Asteraceae) [59]	Leaves	Alcoholic extract	Steroids, triterpenes and flavonoids	Rat & mice	Carbon-tetrachloride
15	*Epaltes divaricata* (Compositae) [60, 61]	Whole plants	Aqueous extract	Flavonoids, ascorbic acid, carotenoids, tannis and lignins	Mice	Carbon-tetrachloride
16	*Emblica officinalis* (Euphorbiaceae) [62]	Fruit	50% Hydroalcoholic extract	Flavanone glycoside such as kaempferol-3-rhamnogluscoside quercetin- 3-rhamnoglucoside. A new flavanone name as stepposide, steppogenin-7-*β*-Dglucopyranoside, robidnol-3-gallate	Rats	Rifampicin, isoniazide & pyrazinamide
17	*Hypericum perforatum* (Clusiaceae) [63]	Dried aerial parts	50% Alcoholic extract	Various type of flavanoids like quercetin, kaempferol, narringenin and isohelichrysin flamin	Male albino Mice	Carbon tetrachloride
18	*Lactuca indica* (Asteraceae) [64]	Aerial parts	95% Methanolic extract	Terpenoids, sterols and flavonoids	Rat	Carbon tetrachloride
19	*Menthapie perata* (Labiatae) [65]	Leaves	Aqueous extract	Mixed flavonoids terpines, myrcene, pipiritone, euginol, menthone	Albino wistar Rats	Carbon-tetrachloride
20	*Silybum marianum* (Asteraceae) [66, 67]	Whole plants	Ethanolic extract	Flavonoids, isoflavonoid and silymarin	Rats	Carbon tetra-chloride-induced liver toxicity
21	*Taraxacum officinale* (Asteraceae) [68, 69]	Roots	Aqueous extract	Carbohydrates, triterpenes, sesquiterpene lactones, flavonoids, fatty acids (myristic), carotenoids (lutein)	Rats	carbon tetrachloride induced liver toxicity

TABLE 3: MEDICINAL PLANTS HAVING ANTI-ULCER ACTIVITY

S. no.	Name of the plant	Part used	Extraction solvent	Chemical constituent	Animal Model	Ulcer creating agent
1	*Alstonia scholrs* (Apocyanacea) [70]	Bark	Ethanolic extract	Alkaloids, coumarins, flavonoids, phlobatannin, reducing sugars, simple phenolic, steroids, saponins and tannins	Male Albino rats	Pylorus ligation model
2	*Anacardium accidentate* **(**Anacardiaceae) [71, 72]	Leaves	Hydroethanolic extract	Catechins	Rat	Pylorus ligation HCl ethanol
3	*Asparagus racemosus* (Asparagaceae) [73]	Roots	Methanolic extract	Shatavarin, flavonoid	Male Albino rats	Indomethacin
4	*Azadirachta indica* (Meliaceae) [74, 75]	Leaves	Aqueous extract	Flavonoids, tannins, carbohydrates, and proteins	Rat	Indomethacin treated, ethanol and histamine
5	*Bauhinia variegate* (Fabaceae) [76]	Leaves	Aqueous extract, ethanolic extract	Flavonoids	Rat	Aspirin

6	*Boswellia serrata* (Burseraceae) [77]	Bark	Petroleum ether	squalene, polyprenol, *β*-sitosterol, lutein, and *β*-carotene	Male Albino rat	Aspirin
7	*Butea foandosa* (Fabaceae) [78]	Leaves	Chloroform and ethanolic extract	Butrin, flavonoids	Rat	Hydrochloric acid
8	*Cucarbita pepo* (cucurbitaceae) [79]	Seed	Methanolic extract	Clycoside terpenoids cucurbitacian	Rat	Stress induced
9	*Cynodon dactylon* (Poaceae) [80]	Aerial parts	Alcoholic extract	Flavonoids	Albino Rats	Pylorus ligation
10	*Eucalypus maculate* (Myrtaceae) [81]	Leaves	Methanolic extract	Quercetin	Rat	Cold resistance and pylorus ligation
11	*Genista rumelica* (Fabaceae) [82, 83]	Whole plant	Methanolic extract	Genistin, luteolin-7-glycoside	Rat	Pylorus ligation
12	*Glicyrriza glabra (*Fabaceae) [84]	dried roots and rhizomes	70% v/v ethanol extract	Flavonoids, glabra	Swiss mice	Water immersion and acetic acid-induced ulcer
13	*Hibiscus rosa* (Malvaceae) [85]	Leaves	Methanolic extract	Flavonoids, anthocyanins	Rat	Pylorus ligation
14	*Moringa oleifera* (Moringaceae) [86]	Leaves	Alcoholic extract	Alkaloids, flavonoids, saponin, tannins, zeatin, quercetin, kaempferol, and terpenoid	Rat	Aspirin and ethanol-induced
15	*Murrya koenigii* (Rutaceae) [87]	Root stem and leaves	Methanolic extract	Monoterpenes, monoterpene hydrocarbons sesquiterpenes	Albino Rat	Hydrochloric acid, Indomethacin
16	*Ocimum sanctum* (Lamiaceae) [88]	Leaves	Alcoholic extract	Alkaloids, tannins, saponins, flavonoids (Apigenin)	Rat	Aspirin and ethanol
17	*Pycnanthus angolensis* (Myristicaceae) [89]	Bark	Ethanolic extract	flavanones-genkwainin, 8 hydroxykanzakiflavone-2 ,liguiritigentin (–)-epicatechin and (+)-catechin	Male Albino Wistar rat	Ethanol
18	*Rhammus procubens* (Rhamnaceae) [90]	Whole plants	Aqueous and ethanolic extracts	Kaempherol	Rat	Pylorus ligation
19	*Sophora subprostrata* (Fabaceae) [91]	Whole plants	Alcoholic extract	Sophoradin	Rat	Pylorus ligated
20	*Sylibin marium* (Asteraceae) [92]	Whole plants	Methanolic extract	Sylimarin	Rat	Ethanol, cold resistance, pylorus ligation

Some Important Flavonoids having Very Good Hepatoprotective and Anti Ulcer Activity:

Luteolin: Luteolin (3´, 4´, 5, 7-tetrahydroxy-flavone) is a natural flavonoid class of compound. It was isolated from the various plant, *Reseda luteola* is one of them. The general appearance of luteolin is a just like yellow microcrystalline shape. Luteolin is now becoming very important herbal drug uses for various type of disease including the life-threatening disease cancer.

From the various study, it has clarified that there is a relation between the oxidative stress and antioxidant in the liver. When human beings are suffering from free oxygen radical, a complex defense system is activated. Here, luteolin has strong superoxide radical scavenging properties [9] **Fig. 1**.

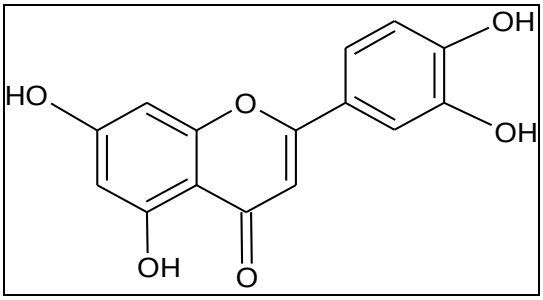

FIG. 1: CHEMICAL STRUCTURE OF LUTEOLIN

Acacetin: Acacetin is an O-methylated flavone found in *Robiniapseudo acacia*. From the previous experiment it was cleared that acacetin is effective in the hepatic disorder of rat which was caused by carbon tetrachloride-induced [94] **Fig. 2**.

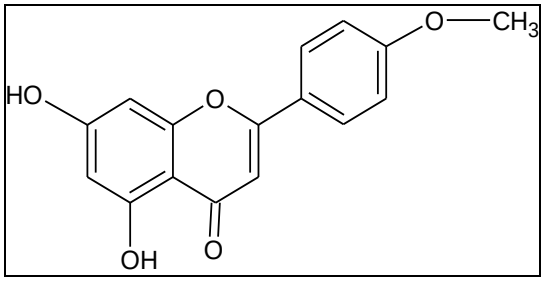

FIG. 2: CHEMICAL STRUCTURE OF ACACETIN

Apigenin: Apigenin (4′, 5, 7-trihydroxyflavone), obtained from many plants. It belongs to the flavones class. It is the aglycone part of the glycoside. Apigenin is the yellow crystalline solid. From the previous study, it was found that apigenin has very good antiulcer activity [95] **Fig. 3**.

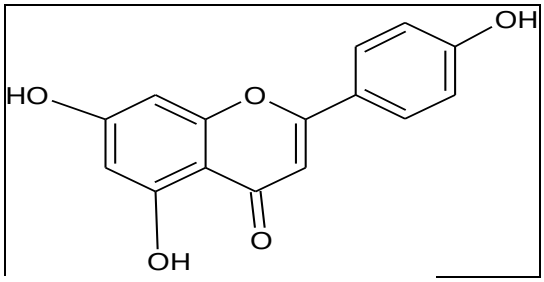

FIG. 3: CHEMICAL STRUCTURE OF APIGENIN

Silymarin: Silymarin is the unique flavanoids complex - containing silybin, silydianin and silicristin-that is the derivative from the milk thistle plant [96]. Now a day role of oxidative free radicals has been implicated in mediating cold-restraint stress. Antioxidant bioflavonoid silymarin has a significant role in the acute cold- restraint stress model of gastric ulceration. Oral treatment with silymarin was found to be effective in the prevention of gastric ulceration induced by cold-restraint stress, in rats [97] **Fig. 4**.

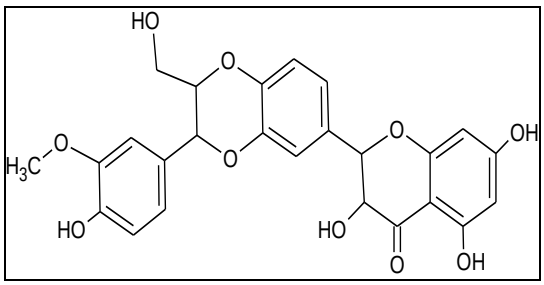

FIG. 4: CHEMICAL STRUCTURE OF SILYMARIN

Kaempferol: Kaempferol is a natural flavonol found from various plants. The appearance of kaempferol is like a yellow crystalline solid. The melting point of kaemferol is 276 - 278 °C (529 - 532 °F). It is slightly soluble in water and highly soluble in hot ethanol, ethers, and DMSO. Kaempferol has a great antioxidant activity, reduce the free radical in our body [97] **Fig. 5**.

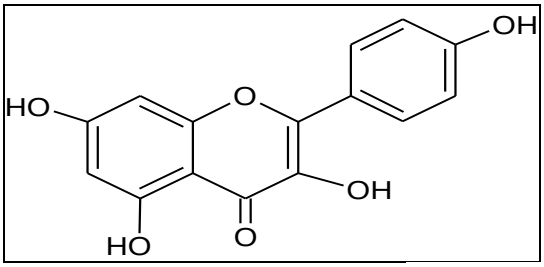

FIG. 5: CHEMICAL STRUCTURE OF KAEMPFEROL

Salvigenin: Salvigenin was isolation from *Dorema glabrum*. Salvigenin was found to possess potent free radical scavenging activity. It was also found that this moiety shows the hepatoprotective activity in acetaminophen (250 mg/kg, i.p) induced liver damage in Swiss albino mice. Salvage in has shown its important on augmentation of antitumor immunity and also the regress the tumor tissues in a mouse model of breast cancer [98, 99] **Fig. 6**.

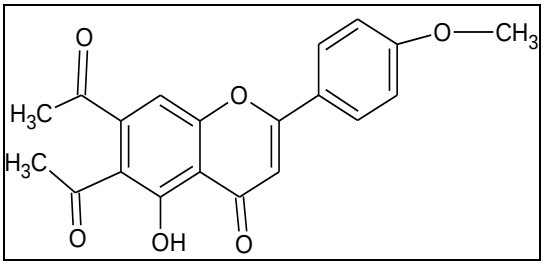

FIG. 6: CHEMICAL STRUCTURE OF SALVIGENIN

Quercetin: Quercetin is a flavonoid, found in many fruits, vegetables, leaves, and grains. It has broad biopharmacological effects, such as hepatoprotective effects, antioxidant and free radical scavenging activity [100]. Quercetin inhibits the cytotoxicity effect of oxidized LDL [101] **Fig. 7**.

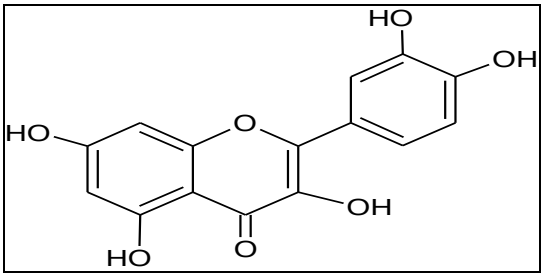

FIG. 7: CHEMICAL STRUCTURE OF QUERCETIN

CONCLUSION: Hepatoprotective and antiulcer effect of plants' extract and isolated compounds are generally polyphenolic compounds, alkaloids, terpenoids, phytosterols, coumarins, *etc*. Among all the other phytoconstituents flavonoid play a significant role as hepatoprotective and antiulcer agents. As a result, now a day flavonoids get very important in the field of phytochemistry. Flavonoids, act as anti-lipoperoxidant agents, antioxidant, and it also has a significant role to reduce the free radical, which are helpful for hepatoprotection.

Flavonoid effectively can reduce body level of serum level such as alanine aminotransferase (ALT) and serum glutamic-oxalocetic transaminase AST, gamma-glutamyltranspeptidase (GGT), thiobarbituric acid-reactive substances (TBARS) tissue, conjugated dienes, lipid hydro-peroxides, protein carbonyl content, bilirubin, ALP, lactate dehydrogenase (LDH).

Flavonoids have a gastric anti secretary and muco-protective activity. Also, out of several leads obtained from plants containing potential hepatoprotective and antiulcer agents, silymarin, kaempferol, quercetin, apigenin, salvigenin, luteolin have been established to have potent hepatoprotective and antiulcer properties. Silymarin is very much effective on treatment of, alcohol-associated liver disease, hepatitis. Poly-phenolic flavonoids can protect cells against the injury due to oxidation of low-density lipoproteins.

Despite inspiring data on the possibility of discoveries in the future, evidence on treatment of peptic ulcer hepatitis or other chronic liver diseases by natural medications is not sufficient. Therefore, medications discovered from natural sources should recommended for conducted more clinical trials. More confidence, better training and little bit awareness for the natural medicine are necessary for of both patients and physicians.

ACKNOWLEDGEMENT: The authors would like to express her thanks to Dr. Avijit Majumder, Director Pharmacy Institute NIET, Greater Noida, Uttar Pradesh.

CONFLICT OF INTEREST: The authors declare that there is no conflict of interest regarding this study.

REFERENCES:

1. Eduardo MS, Eduardo MB and Isela AG: Review of natural products with hepatoprotective effects. World J Gastroenterol 2014; 20(40): 14787-1480.
2. Lagas JS, Sparidans RW, Wagenaar E, Beijnen JH and Schinkel AH: Hepatic clearance of reactive glucuronide metabolites of diclofenac in the mouse is dependent on multiple ATP-binding cassette efflux transporters: Mol Pharmacol 2010; 77(4): 687-694
3. Dong WL, Yun TK and Yu-Jung J: Anti-obesity effect of Artemisia capillaris extracts in high-fat-diet-induced obese rats. Molecules 2013; 18: 9241-9252.
4. Chao WW and Lin BF: Hepatoprotective diterpenoids isolated from *Andrographis paniculata*. Chinese Medicine 2012; 3: 136-143
5. Sharma D and Bhatt S: A compressive review on ulcer potential of medicinal plants. International Journal of Pharmacy and Pharmaceutical Science 2014; 6(10): 829-30.
6. Malfertheiner P, Chan FK and McColl KE: Peptic ulcer disease. The Lancet 2009; 374(9699): 1449-1461.
7. Dey NC and Dey TK: A textbook of pathology. New Central Book Agency 2002.
8. Shah NL, Intagliata NM, Northup PG, Argo CK and Caldwell SH: Procoagulant therapeutics in liver disease: a critique and clinical rationale. Nat Rev Gastroenterol Hepatol 2014; 11: 675-682
9. Shanani S: Evaluation of hepatoprotective efficacy of APCL-A polyherbal formulation *in-vivo* in rats. Indian Drugs 1999; 36: 628-631.
10. Franz CC, Egger S, Born C, Ratz Bravo AE and Krahenbuhl S: Potential drug-drug interactions and adverse drug reactions in patients with liver cirrhosis. Eur J Clin Pharmacol 2012; 68: 179-188.
11. Harshmohan: The Liver, Biliary Tract and Exocrine Pancreas Text Book of Pathology. Jaypee Brothers Medical Publishers (P) Ltd., Edition 4th, 2002.
12. Gupta KA, Ganguly P and Majumder KU: Hepatoprotective and antioxidant effect and steroidal saponins of solanum of *Solanum xanthocarpum* and *Solanum nigrum* in paracetamol induced hepatotoxicity in rats. Pharmacologyonline 2009; 1: 75.
13. Sandhir R and Gill K: Hepatoprotective effects of Liv-52 on ethanol-induced liver damage in rats Ind. J. Expt. Biol 1999; 37: 762-66.
14. Kumar CH, Ramesh A and Kumar JNS: A review on the hepatoprotective activity of medicinal plants. Int J Pharm Sci Res 2011; 2: 501-515.
15. Subbarayappa V: The roots of ancient medicine: a historical outline. Journal of Biosciences 2001; 26(2): 135-143.
16. Girish C and Pradhan SC: Indian herbal medicines in the treatment of liver diseases: problems and promises. Fundamental and Clinical Pharmacology 2012; 26(2): 180-189.
17. Thamotharan G, Shekar G and Ganesh T: Antiulcerogenic effects of *L. camara* Linn leaves on *in-vivo* test models in rats. Asian J Pharm Clinical Res 2010; 3(3): 57-60.
18. Mukherjee P: Quality control of herbal drugs, Business horizons pharmaceutical publisher, New Delhi, Edition 4th, 2010: 529-541.
19. Gilman G: The pharmacological basis of therapeutics. New York: McGraw-Hill, Edition 9th, 2011: 1996.
20. Vinod N, Albina A and Gopalakrishna HN: Evaluation of the anti-ulcer activity of NR-ANX-C (a polyherbal formulation) in aspirin & pyloric ligature-induced gastric

ulcers in Albino rats. Indian J Med Res 2010; 132: 218-1223.
21. Al-Yahya MA, Rafatullah S and Mossa JS: Gastric anti-secretory, antiulcer and cytoprotective properties of ethanolic extract of *Alpinia galangal* willd in on rats. Phytotherapy Re 1990; 4(3): 112-4.
22. Rang HP: Pharmacology. Churchill Livingstone Elsevier, Edition 7th, 2009.
23. Kokate CK, Purohit AP and Gokhale SB: Pharmacognosy. Nirali Prakashan Pune, Edition 13th, 2007.
24. Sivaraj A, Vinothkumar P and Sathiyaraj K: Hepatoprotective potential of *Andrographis paniculata* aqueous leaf extract on ethanol induced liver toxicity in Albino rats. Journal of Applied Pharmaceutical Science 2011; 1(6): 204-208.
25. Geetha A and Saranya P: A study on the gastroprotective effect of *Andrographis paniculata* and andrographolide in rats subjected to pylorus ligation. Journal of Pharmacy Research 2012; 5(2): 787-791.
26. Tabassum N and Agrawal SS: Hepatoprotective activity of *Eclipta alba* Hassk. against paracetamol induced hepatocellular damage in mice. JK Practitioner 2004; 11(4): 278-280.
27. Ahirwar DK and Saxena RC: Hepatoprotective activity of ethanolic extract of *Eclipta alba* in Albino rats. Biomed Pharmacol J 2008; 1(1).
28. Anandan R and Devaki T: Biochemical studies on the antihepatotoxic, the potential of *Picrorhiza kurroa* on mitochondrial damage in D-galactosamine - induced liver intoxication in rats. Med Sci Res 1998; 26: 349-352.
29. Jeyakumar R, Rajesh R and Meena B: Antihepatotoxic effect of *Picrorhiza kurroa* on mitochondrial defense system in antitubercular drugs (isoniazid and rifampicin)-induced hepatitis in rats. Journal of Medicinal Plants Research 2008; 2(1): 17-19.
30. Sinha S, Joshi M and Ghaskadbi S: Hepatoprotective activity of *Picrorhiza kurroa* Royle Ex. Benth extract against alcohol cytotoxicity in mouse liver slice culture. International Journal of Green Pharmacy 2011; 5(3): 244.
31. Nimmi I, Jahan IA and Hossain MH: Comparative study on antioxidant properties of two *Phyllanthus species* growing in Bangladesh, Dhaka University. J Pharm Sci 2013; 11: 191-7.
32. Warrier PK, Nambiar VP and Raman KC: Indian medicinal plants: A compendium of 500 species. Hyderabad: Orient Longman Publisher 1994.
33. Subramoniam A, Evans DA and Rajasekharan S: Hepatoprotective activity of *Trichopus zeylanicus* extract against paracetamol-induced hepatic damage in rats. Indian J Exp Biol 1998; 36(4): 385-9.
34. Reddy MVV, Rajani A, Nikitha S, Jincy T and Hemamalini K: Antihyperlipidemic activity of *Trichopus zeylanicus* leaves against high fat diet and triton X- 100 induced hyperlipidemia, World Journal of Pharmacy and Pharmaceutical Sciences 2014; 3(3): 1017-1025.
35. Awaad AS, Maitland DJ and Soliman GA: Hepatoprotective activity of *Schouwia thebica* Webb, Bioorg Med Chem Lett 2006; 16(17): 4624-8.
36. Okasha MAM, Abubakar MS, Fatihu MY and Magaji RA: Antiulcerogenic and anti-secretory activity of the *n*-butanol portionof *Syzygium aromaticum* in the rat. Nig Journ Pharm Sci 2007; 6(2): 119-126.
37. Santin JR, Lemos M and Klein-Júnior LC: Gastroprotective activity of essential oil of the *Syzygium aromaticum* and its major component eugenol in different animal models. Naunyn Schmiedebergs Arch Pharmacol 2011; 383(2): 149-58.
38. Sharma SS and Gupta YK: Reversal of cisplatin-induced delay in gastric emptying in rats by ginger (*Zingiber officinale*). J Ethnopharmacol 1998; 62(1): 49-55.
39. Minaiyan M, Ghannadi A and Karimzadeh A: Anti-ulcerogenic effect of ginger (Rhizome of *Zingiber officinale* Roscoe) on cystemine induced duodenal ulcer in rats. Daru 2006; 14(2): 97-101.
40. Vendrichelvan T, Jegdeesan M and Palaniappan MS: Diuretic and anti-inflammatory activity of *Aerva lanata* in the rat. Indian Journal of Pharmaceutical Science 2000; 62(4): 300-302.
41. Rrajesh, Chitra K and Padmaa MP: *Aerva lanata* (Linn.) juss ex Shult - An review. Indian Journal of Natural Product and Resources 2011; 2(1): 5-9.
42. Gole MK and Dasgupta S: Role of plant metabolites toxic liver injury. Asia Pacific Journal of Clinical Nutrition 2002; 11: 48-50.
43. Consolacion SY, Ragasa MA and Leonora TA: Terpenoids and sterol from *Aphanamix ispolystachya*. Journal of Chemical and Pharmaceutical Research 2014; 6(6): 65-68.
44. Kazemi S, Asgary S and Moshtaghian J: Liver-protective effects of hydroalcoholic extract of *Allium hirtifolium* Boiss. In rats with alloxan-induced diabetes mellitus. Arya Atheroscler 2010; 6: 11-15.
45. Rose P, Whiteman M and Moore PK: Bioactive S-alk(en)ylcysteine sulfoxide metabolites in the genus *Allium*, the chemistry of potential therapeutic agents. Nat Prod Rep 2005; 22: 351-368.
46. Hurkadale PJ, Shelar PA and Palled SG: Hepatoprotective activity of *Amorphophallus paeoniifoliustubers* against paracetamol-induced liver damage in rats. Asian Pacific Journal of Tropical Biomedicine 2012; 238-242.
47. Amagase H, Petesch BL and Matsuura H: Intake of garlic and its bioactive components. Journal of Nutrition 2001; 131: 955-962.
48. Obioha UE, Suru SM and Ola-Mudathir KF: Hepatoprotective potentials of onion and garlic extracts on cadmium-induced oxidative damage in rats. Biol Trace Elem Res 2009; 129: 143-156.
49. Fatehi M, Saleh TM and Fatehi-Hassanabad Z: Pharmacological study on *Berberis vulgaris* fruit extract. J Ethno pharmacol 2005; 102: 46-52.
50. Domitrovic R, Jakovac H and Blagojevic G: Hepatoprotective activity of berberine is mediated by inhibition of TNF-α, COX-2, and I NO expression in CCl_4-intoxicated mice. Toxicology 2011; 280: 33-43.
51. Preethi KC and Kuttan R: Hepato and reno protective action of *Calendula officinalis* L. flower extract. Indian J Exp Biol 2009; 47: 163-168.
52. Valan MF, Britto AJD and Venkataraman R: Phytoconstituents with hepatoprotective activity. Int J Chem Sci 2010; 8(3): 1421-1432.
53. Bartalis J: Hepatoprotective activity of cucurbitacin [dissertation]. Brookings: South Dakota State University 2005.
54. Altas S, Kizil G and Kizil M: Protective effect of DiyarbakIr watermelon juice on carbon tetrachloride-induced toxicity in rats. Food Chem Toxicol 2011; 49: 2433-2438.
55. Balasubramaniam P, Pari L and Menon VP: Protective effect of carrot (*Daucus carota* L.) against lindane – induced hepatotoxicity in rats. Phytotherapy Research 1998; 12: 434-436.
56. Vasudevan M, Gunnam KK and Parle M: Antinociceptive and anti-inflammatory properties of *Daucu scarota* seeds extract. J Health Sci 2006; 52: 598-606.

57. Srivastava A and Shivanandappa T: Hepatoprotective effect of the aqueous extract of the roots of *Decalepi hamiltonii* against ethanol-induced oxidative stress in rats. Hepatology Research 2006; 35: 267-275.
58. Harish R, Divakar S, Srivastava A and Shivanand T: Isolation of antioxidant compounds from the methanolic extract of the roots of *Decalepis hamiltonii* (Wight and Arn.). J Agric Food Chem 2005; 53: 7709-7714.
59. Singh B, Saxena AK and Chandan BK: Hepatoprotective effect of ethanolic extract of *Eclipta alba* on experimental liver damage in rats and mice. Phytotherapy Research 1993; 7: 154-158.
60. Hewawasam RP, Jayatilaka KAPW and Pathirana C: Hepatoprotective effect of *Epaltes divaricata* extract on carbon tetrachloride-induced hepatotoxicity in mice. Indian J Med Res 2004; 120: 30-34.
61. Rusu MA, Tamas M, Puica C and Roman I: The hepatoprotective action of ten herbal extracts in CCl_4 intoxicated liver. Phytotherapy Res 2005; 19: 744-749.
62. Tasduq SA, Kaisar P, and Gupta DK: Protective effect of a 50 hydroalcoholic fruit extract of *Emblica officinalis* against anti-tuberculosis drugs induced liver toxicity. Phytotherapy Research 2005; 19: 193-197.
63. Ozturk Y, Aydin S and Baser KHC: Hepatoprotective activity of *Hypericum perforatum* L. alcoholic extract in rodents. Phytotherapy Research 1992; 6: 44-46.
64. Ki HK, Young HK and Kang R: Isolation of hepatoprotective phenylpropanoid from *Lactuca indica*. Natural Product Sciences 2010; 16(1): 6-9.
65. Shah PP and Mello PMD: A review of medicinal uses and pharmacological effect of *Menthapi perita*. Natural Product Radiance 2014; 3(4): 214-221.
66. Salam OM, Sleem AA and Omara EA: Hepatoprotective effects of misoprostol and silymarin on carbon tetrachloride-induced hepatic damage in rats. Fundam Clin Pharmacol 2009: 23: 179-188.
67. Kim SH, Cheon HJ and Yun N: Protective effect of a mixture of *Aloe vera* and *Silybum marianum* against carbon tetrachloride-induced acute hepatotoxicity and liver fibrosis. J Pharmacol Sci 2009; 109: 119-127.
68. Fallah H, Zarrei M and Ziai M: The effects of *Taraxacum officinale* L. and *Berberis vulgaris* L. root extracts on carbon tetrachloride induced liver toxicity in rats. J Med Plants 2010; 9: 45-52.
69. Mahesh A, Jeyachandran R, Cindrella L, Thangadurai D, Veerapur V and Rao MD: Hepatocurative potential of sesquiterpene lactones of *Taraxacum officinale* on carbon tetrachloride induced liver toxicity in mice. Acta Biol Hung 2010; 61: 175-190.
70. Arulmozhi S, Papiya MM and Sathiyanarayanan L: Analgesic, anti-inflammatory and anti-ulcerogenic activities of fractions from *Alstonia scholaris*. Pharmacologia 2012; 3: 132-7.
71. Konan NA and Bacchi EM: Antiulcerogenic effect and acute toxicity of a hydroethanolic extract from the cashew (*Anacardium occidentale* L.) leaves. J Ethnopharmacol 2007; 112(2): 237-42.
72. Adeleye OE, Okediran BS and Rahman SA: Effect of intragastric administration of crude aqueous leaf extract of *Anacardium occidentale* on gastric acid secretion in rats. Niger J PhysiolSci, 2010; 25(1): 59-62.
73. Bhatnagar M and Sisodia SS: Antisecretory and antiulcer activity of *Asparagus racemosus* against indomethacin plus phyloric ligation-induced gastric ulcer in rats. J Herb Pharmacother 2006; 6(1): 13-20.
74. Chattopadhyay I, Nandi B and Chatterjee R: Mechanism of antiulcer effect of neem (*Azadirachta indica*) leaf extract: effect on H^+-K^+-ATPase, oxidative damage and apoptosis. Inflammo Pharma 2004; 12(2): 153-76.
75. Raji Y, Ogunwande IA and Osadebe CA: Effects of *Azadirachta indica* extract on gastric ulceration and acid secretion in rats. J Ethnopharmacol 2004; 90(1): 167-70.
76. Rajkapoor B, Jayakar B and Anandar R: Antiulcer activity of *Bauhinia variegata* Linn. Journal of Natural Remidies 2003; 3(2): 215-217.
77. Khaja Z, Mangamoori LN and Muna A: Evaluation of antiulcer activity of *Boswellia serrata* bark extracts using aspirin-induced ulcer model in Albino rats. J Med Allied Sci 2011; 1(1): 14-20.
78. Ramesh L and Ranirukmini RK: Antiulcerogenic study of different extracts of *Butea frondosa* Roxb in Albino mice. J Pharmacog 2010; 1(1): 6-9.
79. Gill NS and Bali M: Isolation of antiulcer Cucurbitane-type triterpenoids from the seed of *Cucurbita pepo*. Research journal of phytochemistry 2011; 5(2): 72-79.
80. Kondaveeti SB, Ivvala AS, Dadduru K, Basha SS and Sailaja I: Igenious effect of *Cynodon dectylon* in experimental induced ulcer and gastric secretion. Internal Research Journal of Pharma 2012; 3(5): 301-304.
81. Willoughby GA and Hayward AC: Degradation of delignified *Eucalyptus maculate* by cell vibrio mixtus. Letters in Applied Microbiology 1988; 6(5): 99-103.
82. Rainova L, Nakov N, Bogdanova S and Minkov E: Ulceroprotective activity of the flavonoids of *Genista rumelica* Vel. Phytother Res 1988; 2: 137-139.
83. Kottaimuthu R: Ethnobotany of the Valaiyans of Karandamalai, Dindigul District, Tamil Nadu. India, Ethnobotanical Leaflets 2009; 12: 195-203.
84. Vahid N, Ehsan A, Mostafa M, Hadi KG and Amina J: Antiulcer properties of *Glycyrrhiza glabra* L. extract on experimental models of gastric ulcer in mice. Iranian Journal of Pharmaceutical Research 2015; 14(4): 1163-1170.
85. Srivastava S, Jiaswal J, Gautam H and Sharma S: Antiulcer activity of methanolic extract of *Hibiscus rosa sinensis* leaves. Int J Pharm Pharm Sci 2013; 5(3): 829-30.
86. Verma VK, Singh N, Saxena P and Singh R: Anti-ulcer and antioxidant activity of *Moringa oleifera* (Lam) leaves against aspirin and ethanol-induced gastric ulcer in rats. Res J of Pharmaceuticals 2012; 2(2): 46-57.
87. Mitra PK: Comparative evaluation of anti-ulcer activity of root, stem and leave of *Murrya koenigii* (Linn.) spreng in rats. Journal of Medicinal Plants Studies 2013; 1(3): 158-165.
88. Dharmani P, Kulchibhota VK and Mauriya R: Evaluation of anti-ulcerogenic and ulcer healiung property of *Ocium sanctum* linn. J ethnopharmacol 2004; 93: 197-206.
89. Margaret OS and Adepero OA: Antinociceptive and antiulcer activities of *Pycnanthu sangolensis*. Revista Brasileira de Farmacognosia 2015; 25: 252-257.
90. Goel RK and Pendey VK: Antiinflammatory and antiulcer effects of kaempferol, a flavone, isolated from *Rhamnus procumbens.* Indian J Exp Biol 1988; 26: 121-24.
91. Iinuma M, Ohyama M and Tanaka T: Six Flavonostilbenes and a flavanone in roots of *Sophora alopecuroides*. Phytochemistry 1995; 38: 519-525.
92. Tumova L, Rimakova J and Tuma J: *Silybum marianum in-vitro* flavonolignan production. Plant Soil Environ 2006; 52(10): 454-8.
93. Barnaulov OD, Manicheva OA and Zapesochnaya GG: Effects of certain flavonoids on the ulcerogenic action of reserpine mice. Khim. Farm. Zh 1982; 16: 300-303.
94. Salama MM, Ezzat SM and Sleem AA: A new hepatoprotective flavone glycoside from the flowers of

Onopordum alexandrinum growing in Egypt. Z Naturforsch C 2011; 66(5-6): 151-159.
95. Tumova L, Rimakova J Onopordumalexandrinum Tuma J: *Silybum marianum in-vitro* flavonolignan production. Plant Soil Environ 2006; 52(10): 454-8.
96. Shobha V, Huilgol and Jamadar MG: Gastroprotective role of bioflavonoid silymarin in an animal model of acute cold-restraint stress induced gastric ulceration. Al Ameen J Med Sci 2013; 6(1): 40-43.
97. Majid AS, Najme KF, and Nafiseh A: Medicinal plants with hepatoprotective activity in Iranian folk medicine. Asian Pacific Journal of Tropical Biomedicine 2015; 5(2): 146-157.
98. Shokoofe N, Zuhair M and Hassan BY: Antitumor and immunomodulatory effects of salvigenin on tumor-bearing mice. Cellular Immunology 2013; 286(1-2): 16-20.
99. Sasajima M, Nakane S, Saziki R and Saotome: Studies on the anti-ulcer effects of isoprenyl flavonoids. Nihon Yakurigaku zasshi 1978; 74(8): 897-905.
100. Chen X: Protective effects of quercetin on liver injury induced by ethanol. Pharmacognosy Magagine 2010; 6(22): 136-141.
101. Anne N and Robert S: Quercetin prevents the cytotoxicity of oxidized LDL on lymphoid cell lines. Free Radical Biology and Medicine 1992; 12(2): 101-106.

How to cite this article:
Majee C, Mazumder R and Choudhary AN: Medicinal plants with anti ulcer and hepatoprotective activity: a review. Int J Pharm Sci & Res 2019; 10(1): 1-11. doi: 10.13040/IJPSR.0975-8232.10(1).1-11.