Liver, being an important body organ, plays a vital role in metabolism. A great challenge to health care professionals and pharmaceutical industries is to deal with liver injuries and other liver disorders. Multiple factors (Biological, chemical, drug overdose) are associated with liver disorders. Synthetic pharmaceutical drugs which are generally applied for its treatment further accelerate the disorders. In this situation, a great reliance has been evident on natural products which seem promising in dealing with liver problems effectively. One of the major source of natural products are plants. Plants contain active constituents known as phytochemicals, which have been tested for their hepatoprotective potential in many parts of the world. The current review aimed at compiling the data of some important medicinal plant which have been studied during last ten years worldwide with proven hepatoprotective activity.

ABSTRACT

Liver can be considered as chief metabolic organ of the body. Many of the metabolic activities like secretion, Storage and detoxification of waste metabolites and toxic compounds are performed by the liver. Hepatic problems can be considered as major threat to public health worldwide. Variety of causative factors can be found associated with liver disorders. These factors can be biological (bacteria, virus and parasites) or autoimmune diseases (immuno hepatitis, primary biliary cirrhosis). Along with this, different chemicals can also induce liver disorders. These include some drugs i.e High dose of paracetamol, antituberculosis drugs, toxic compounds such as carbon tetrachloride (CCl4), thioacetamide, diethylenitosamine, D-glactosamine/ lipopolysaccharides and over dose of alcohol. There are no effective medicines developed yet which could be promising in stimulating hepatic function, protection and regeneration of liver cell. There is high need to develop alternative drugs to protect and treat liver disorders. The use of medicinal plants in Homeopathic, Ayurvedic, Unani and Chinese medicine is as old as those of human civilization. The written evidences about the use of drugs from the plants is about 80% of population uses herbal medicins for primary health care. Recently used drugs against cancer such as Taxol, Podophylotoxin, Vincristin and Camptothecin are derived from the plants. About 25% drugs are reported to be plants derived in America and 119 drugs are important whose ingredients are derived from plants. Large number of plants have been reported from China, Europe and India to treat liver diseases. These include Curcuma longa, Picrorrhiza kurroa, Camellia sinensis, Silybum marianum and Taraxicum officinale. Medicinal plants have great prospective of active compounds to be used for drug discovery.

INTRODUCTION

Liver can be considered as chief metabolic organ of the body. Many of the metabolic activities like secretion, Storage and detoxification of waste metabolites and toxic compounds are performed by the liver. Hepatic problems can be considered as major threat to public health worldwide. Variety of causative factors can be found associated with liver disorders. These factors can be biological (bacteria, virus and parasites) or autoimmune diseases (immuno hepatitis, primary biliary cirrhosis). Along with this, different chemicals can also induce liver disorders. These include some drugs i.e High dose of paracetamol, antituberculosis drugs, toxic compounds such as carbon tetrachloride (CCl4), thioacetamide, diethylenitosamine, D-glactosamine/ lipopolysaccharides and over dose of alcohol. There are no effective medicines developed yet which could be promising in stimulating hepatic function, protection and regeneration of liver cell. There is high need to develop alternative drugs to protect and treat liver disorders. The use of medicinal plants in Homeopathic, Ayurvedic, Unani and Chinese medicine is as old as those of human civilization. The written evidences about the use of drugs from the plants is about 80% of population uses herbal medicins for primary health care. Recently used drugs against cancer such as Taxol, Podophylotoxin, Vincristin and Camptothecin are derived from the plants. About 25% drugs are reported to be plants derived in America and 119 drugs are important whose ingredients are derived from plants. Large number of plants have been reported from China, Europe and India to treat liver diseases. These include Curcuma longa, Picrorrhiza kurroa, Camellia sinensis, Silybum marianum and Taraxicum officinale. Medicinal plants have great prospective of active compounds to be used for drug discovery.

Hepatoprotective plants

Aerva javanica

Aerva javanica belongs to family Amaranthaceae and being used as traditional medicinal plant. Aqueous methanic extract (70%) had been tested for its hepatoprotective activity on albino rats. It showed that A. javanica extract applied against Paracetamol (PCM) intoxication reduced the increased levels of liver marker enzymes (p< 0.5). Phytochemical analysis of A. javanica extract confirmed the presence of glycosides, flavonoids, Saponins, Terpenes and Tannins. This investigation confirmed the hepatoprotective potential of A. javanica. In another study, Arbav et al investigated the hepatoprotective efficacy of A. javanica against CCl4 induced liver injury in rats. It was observed that hepatocyte recovery was 90.2% by treatment with A. javanica extract. The CCl4 revealed that antioxidant activity was due to the presence of alkaloids, flavonoids, tannin, sterols and saponin. It was concluded that A. javanica has potential attenuation of in vitro and in vivo hepatotoxicity and oxidative damage.

Alhagi maurorum

Alhagi maurorum is an important medicinal plant. It belongs to family Leguminosae. Aqueous methanolic extract (500mg/kg) of A.maurorum was tested on rabbits intoxicated by

| 1. Ph.D Student |
| 2. Assistant Professor of Biotechnology |
| 3. MS Student |
| International Islamic University Islamabad |

Correspondence to:
Atta ur Rehman Khan
MS Student
International Islamic University Islamabad
Email: aurehman321@gmail.com

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administration of paracetamol (250mg/kg). It was concluded that there was significant reduction in Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Alkaline phosphatase (ALP) and serum bilirubin (SB) after treatment with A.maurorum extract confirmation of hepatoprotective activity of A.maurorum was strength by histopathological studies. It was further confirmed that tannins, saponins, alkaloids and flavonoids present in A. Maurorum extract showed hepatoprotective activity against paracetamol (PCl) induced toxicity in rats. In another study hepatoprotective activity of A. Maurorum was investigated against carbon tetrachloride and acetaminophen induced toxicity in mice. A significant decrease in level of liver marker enzymes in the serum was found which confirmed the hepatoprotective potential of A. Maurorum extract. **Clitoria ternatae**

Clitoria ternatae is another medicinal plant which was investigated for its hepatoprotective activities. Biomolecules extracted from C. ternatae were evaluated invivo and invitro for hepatoprotective effects against CCl₄ toxicity in rats. AST, ALT and bilirubin reduced significantly in hepatotoxic rats against CCl₄ treatment. Results showed that C. ternatae extract dose (500mg/kg) had best hepatoprotection against CCl₄. Hepatoprotective and antioxidant activity of flowers extract of C.ternatae was investigated in another study. That study came out with the outcome of 68.9% antioxidant activity having IC₅₀ value of 327 µg/mL. Whereas acetaminophen induced toxicity in rats showed significant decrease in levels of AST, ALT, ALP and serum bilirubin when treated with flowers extract of C.ternatae. Histopathological studies also confirmed the hepatoprotective activity of C.ternatae flowers extract. The leaf extracts of C.ternatae was tested for hepatoprotective and antioxidant study against paracetamol induced damage in mice. This study also concluded that leaf extract of C.ternatae was found associated with hepatoprotective activity which was related to its antioxidant potential.

**Phyllanthus amarus**

Enogieru et al confirmed the hepatoprotective role of Phyllanthus amarus experimentally on Wistar rats. Liver protection was significantly shown by leaves extract of P.amarus and silymarin against acetaminophen induced toxicity when compared to acetaminophen induction only. There was significant increase in alanine transaminase (ALT), aspartate aminotransferase (AST), ALP and reduction in total protein in rats which were treated only by acetaminophen. It was further confirmed that level of ALT, AST, and ALP decreased when acetaminophen intoxicated rats were treated with P.amarus leaves extract and Silymarin. This proved the effectiveness of P.amarus leaves extract against acetaminophen toxicity. The same plant was investigated both invivo and invitro for mechanism of hepatoprotection by Pramyothin et al against ethanol induced hepatic injury. In invitro study, it was concluded that P.amarus decreased the release of AST and ALT in rats primary hepatocytes. Whereas invivo study came up with the increase in liver cell recovery by decreasing the level of AST, ALT, hepatic triglycerides (HTG) and tumor necrosis factor alpha (TNF-α). Hepatoprotective role of P.amarus was related to its antioxidant activity.

**Acacia modesta**

Rahaman and Chaudhry investigated the mechanism of protective effect of Acacia modesta bar against paracetamol induced hepatotoxicity in mice. The reduction in level of ALT, AST and ALP showed that A.modesta extract have hepatoprotective constituents. While serum albumin and total protein level which were reduced on treatment with acetaminophen were normalized by A.modesta extract. It proved as a good antioxidant than ascorbic acid. Phytochemical analysis showed that antioxidant activity is due to Tannins and saponins extract. These analysis showed that A.modesta has significant hepatoprotective potentials effects.

**Cuminum cyminum**

Mushtaq et al carried out the study for evaluation of hepatoprotective activity of aqueous ethanolic extract of Cuminum cyminum seed against the hepatotoxicity induced by Nimesulide (NSAID) on albino rats. Liver marker enzymes serum glutamate pyruvic transaminase (SGPT), serum glutamate oxaloacetate (SGOT), alkaline phosphatase (ALP) and total bilirubin in rats when intoxicated with Nimesulide, were measured. When animals were treated with C.cyminum (100,200 and 300 mg/kg) after intoxication, then liver marker enzymes restored to normal (P<0.001) which were comparable to Silymarin (25mg/kg) treated results. Histological examinations also confirmed the hepatoprotective activities and was recommended to isolate pure compound. In another study conducted by Ekta and Dwijendra, ethanolic extract of C. cyminum was tested for cytotoxic activity by using human liver cancer cell line (Hep-2). Anticancer activities against liver cancer cell line was estimated about 31% growth inhibition.

**Conyza bonarisis**

Saleem et al studied another important medicinal plant. C.bonarisis ethanolic extract was studied against paracetamol induced hepatotoxicity in mice. It showed that C.bonarisis extract (250mg/Kg and 500mg/kg) reduced the level of liver marker enzymes and total bilirubin which were raised on intoxication with paracetamol but the level. It was supported by histopathological results of liver. HPLC analysis confirmed the presence of quercetin as an active constituent which was present in ethanolic extract of C.bonarisis.

**Malva sylvestris**

In another study Hussain et al demonstrated the hepatoprotective effects of M.sylvestris against paracetamol induced toxicity in mice. It was observed that on treatment of mice with M.sylvestris, the levels of liver marker enzymes i.e ALT, AST, ALP and total SB significantly reduced which had been elevated due to toxic effects of paracetamol. Hepatoprotective effect of M.sylvestris was also confirmed by histopathological examination of liver. It was suggested that M.sylvestris has strong hepatoprotection against paracetamol induced liver injury in mice.

**Dicaropteris linearis**

Ismail et al studied hepatoprotective effects of D.linearis aqueous leaf extract (DLAE) against CCl₄, or paracetamol induced toxicity. Biochemical and histopathological assessment showed that high dose of DLAE significantly (p<0.05) reduced the level of ALP, AST and ALT against paracetamol or CCl₄. There were necrosis and inflammation in liver due to CCl₄ or paracetamol toxicity.
induced hepatoprotective activities due to antioxidant properties and high content of flavonoids. The methanolic extract of leaves of the same plant was tested against CCl4-induced liver toxicity in rats. It was observed that the serum level of AST, ALT and ALP decreased in the mice which were pretreated with methanol extract of D. linearis, which were increased when CCl4 was administered. It was concluded that hepatoprotective activity of D. linearis was attributed to its antioxidant activity. Similar study was conducted by Mamat et al on the methanolic extract of D. linearis leaves (MEDL) for its hepatoprotective activity against paracetamol and CCl4-induced liver damage in rats. The liver marker enzymes level was reduced to normal when treated with MEDL. It was concluded that hepatoprotective activity of MEDL is attributed to its antioxidant activity and flavonoids contents.

Bauhina hookri
A study was carried out by Sayed et al for investigation of hepatoprotective and antioxidant role of B. hookri ethanol extract (BHE) against toxicity induced by CCl4. Biochemical analysis of marker enzymes ALT, AST and ALP was evaluated. CCl4 induced increased liver marker enzymes ALT (44 and 64%), AST (36 and 46%), ALP (28 and 42%) and malondialdehyde (MDA) (39 and 51%) were significantly inhibited by BHE treatment while antioxidant parameters like glutathione (GSH), glutathione peroxidase (GPx), glutathione reductase (GR), glutathione transferase (GST) and superoxide dismutase (SOD) were increased on treatment with BHE. Hepatoprotective effects were confirmed by histopathological studies. There was strong protection against pathological changes of liver and beneficial effects against oxidative stress by BHE supplement. Hepatoprotective and nephroprotective role of polyphenol rich fraction (BHPF) obtained from B. hookri was investigated against hepatorenal toxicity in mice induced by CCl4, treatment. There was inhibition of ALT, AST, ALP, Bilirubin, Cholesterol, Uric acid and LDH on treatment with BHPF against CCl4. Antioxidant parameters such as glutathione and SOD markedly increased on pretreatment with BHPF. It was concluded that BHPF has hepatoprotective activity which increase the antioxidant defense status of liver and kidney.

Taraxacum officinale
A study conducted by Abdulrahman et al showed the investigation about hepatoprotective activity of Taraxacum officinale (Dandelion) leaves water extract against CCl4 induced liver toxicity in mice. Hepatoprotective activity of Dandelion leaves water extract was studied by evaluation of biochemical parameters. Genomic DNA integrity and histopathological studies of mice liver further supported the hepatoprotective activity. CCl4 had severe damage on liver which was confirmed by elevated levels of marker enzyme of liver. Normal function of hepatocytes was confirmed by reduced levels of marker enzymes with the treatment of Dandelion leaf water extract. It was concluded that Dandelion leaves extract had significant hepatoprotective activities and could be further evaluated to isolate active compound. Hepatoprotective effects of aqueous extract from T officinale root against alcohol induced oxidative stress was investigated invivo and invitro by Yanghee et al. In the presence of hot water extract of T.officinale root, no hepatic damage was observed in the cells treated with ethanol. The mice treated with ethanol with hot water extract of T. officinale root showed the prevention of hepatotoxicity. There was significant decrease in AST, ALT, ALP and lactate dehydrogenase when compared to the ethanol alone. These results suggested that aqueous extract of T.officinale root has protective action against ethanol induced toxicity to liver by elevating the antioxidant activity.

Cichorium intybus
In another study, acute liver inflammation in rats induced by CCl4 was cured by treatment with Cichorium intybus (Chicory) and Taraxacum officinale (Dandelion) water extract. Hepatoprotective activity of Chicory leaves alone or mixed with Dandelion leaves water extract was investigated against CCl4 intoxication in Wister albino rats. A severe hepatic damage was noted as elevated levels of liver marker enzymes due to treatment with CCl4. A significant reduction in liver marker enzymes was observed during treatment with Chicory/mixture of chicory/Dandelion water extract. Another study was conducted by Guo- Yu et al to investigate the hepatoprotective effect of Cichorium intybus extract against CCl4 induced liver damage in rats. A significant hepatoprotective activity of Cichorium intybus plant extract was observed on measurement of liver marker enzymes. It was concluded that C intybus effectively protects hepatic fibrosis against CCl4 induced hepatic damage. It has promising anti-fibrotic therapeutic agents.

Canscora decussate
Canscora decussate is medicinal plant. Aqueous and methanolic extract of C. decussate was investigated to know the hepatoprotective effect against CCl4 induced liver damage in rabbits. Silymarin was used as control. Liver marker enzymes AST, ALT, ALP and bilirubin were evaluated. Significant hepatoprotective effect was observed in methanolic extract while moderate activity of aqueous extract was exhibited against CCl4 treated animals. It was confirmed that C. decussate have hepatoprotective potential against CCl4 induced liver damage. Hepatoprotective protective activity of C. decussate was further investigated against paracetamol induced toxicity in the rabbits. Oral administration of plant extract showed significant hepatoprotective activity concluding that C. decussate hepatoprotective activity may be due to the presence of flavonoids.

Dalbergia spinosa
Another study showed the hepatoprotective effect of D. spinosa against paracetamol induced toxicity in rats. The Silymarin was used as standard drug for liver recovery. Levels of liver marker enzymes SGPT, SGOT, ALP and serum bilirubin were increased in rats treated with paracetamol prior to administration of methanolic and aqueous extracts. Values of those parameter were significantly reduced on treatment with methanolic and aqueous extract (p<0.01). These results were confirmed by histopathological examinations of liver of control and treated groups. It was concluded that D. spinosa has hepatoprotective effects against paracetamol induced liver damage.

Convolvulus arvensis
Convolvulus arvensis is medicinal plant which is reported to be used against cough, flu, jaundice and skin diseases. It was also reported to be used against painful joints, inflammation and...
swelling. Ali et al evaluated the hepatoprotective activity against paracetamol induced hepatic damage in mice. Extract of C.arvensis (200mg/kg and 500mg/kg) significantly (p<0.05) decreased the levels of liver marker enzymes and total bilirubin which were increased by paracetamol induced toxicity. Histopathological investigations and analysis of active constituents i.e quercetin by HPLC supported the hepatoprotective results of C.arvensis.

Modeistica charantia
Hepatoprotective and hepatocurative effects of M.charantia were investigated by analysis of different serum enzymes which included ALT, AST and LDH. There were two phases of the study. In phase one rabbits were induced toxicity with the administration of acethylomphen and then extract of M.charantia was given to observe hepatoprotective effects. It was observed that the elevated levels of enzymes were significantly decreased in acethylomphen-induced rabbits. In second phase, prior oral administration of M.charantia extract was given for 15 days and then acethylomphen was administered. Reduced level of marker enzymes showed the hepatoprotective effect of M.charantia. Another study was conducted by Ajilore et al to investigate the hepatoprotective effects of methanolic extract of M. charantia leaves. Hepatotoxicity in rats was induced by cadmium. Serum total protein, albumin, ALT and AST were evaluated. Total protein and albumin level was significantly reduced while ALT and AST level was raised. It was observed that toxic effect of cadmium was significantly controlled in the rats pre- treated with methanolic extracts M.charantia.

Mentha arvensis
In another study ethanol, chloroform and aqueous extracts of M. arvensis leaves were studied to evaluate its hepatoprotective effects against CCl4 induced liver damage in rats. Carbon tetrachloride (CCl4) was used to induce toxicity. Histopathological changes in liver and biochemical parameters such as serum glutamate pyruvate transaminase (SGPT), serum glutamate oxaloacetate transaminase (SGOT), alkaline phosphatase (ALP) and serum bilirubin (SB) were analyzed. There was significant reduction in values of marker enzymes (p<0.01). The phytochemical investigations of M. arvensis leaves extract showed the presence of compounds of flavonoids, steroids, triterpenoids, alkaloids, glycosides, carbohydrates, tannins and phenols. It was concluded that M. arvensis had hepatoprotective effects against CCl4 induced liver damages in rabbits. Hepatoprotective and antioxidant activity of ethanol extract M.arvensis against CCl4 induced hepatic damage in rats was investigated in another study. It was observed that the level of AST, ALT, ALP and bilirubin was decreased while the level of antioxidant enzymes significantly increased on treatment of rats with M. arvensis leaves extract. The result of the study strongly indicated that M. arvensis leaves has potent hepatoprotective effects.

Sonchus asper
Another study showed the hepatoprotective effect of S.asper methanol extract (SAME). S.asper was evaluated against the CCl4 induced liver damage in rats. The parameters of serum enzymes, antioxidant enzymes activities and histopathological studies, estimated the hepatoprotective effect of SAME. It was concluded that treatment with SAME and silymarin significantly lowered the serum level of liver marker enzymes (aspartate aminotransferase, alanine aminotransferase and lactate dehydrogenase), lipoproteins, triglycerides, cholesterol and low density lipoprotein, that were elevated by CCl4 treatment. SAME and Silymarin also reduced the increased level of thioobarburic acid reactive substances. Histopathology showed the reduced incidences of hepatic lesions induced by CCl4 in rats. So it was concluded that S.asper protects the liver against the damages induced by CCl4. Methanolic extract of S.asper (SAME) was applied against Gentamycin induced changes in the liver and kidney to identify the hepatoprotective activity. It was observed that Gentamycin increased the level of ALT, AST, ALP, total cholesterol, triglycerides, total protein, albumin, creatinine and bilirubin while the level of antioxidant enzymes such as CAT, POD, SOD was found decreased. On administration of dose of SAME prevented the alteration in the biochemical parameters against Gentamycin. It was concluded that Gentamycin induced toxicity was prevented by phytochemical of S.asper showing antioxidant property.

Cinnamomum zeylanicum
Another medicinal plant which is reported to be used against diseases treatment and its inner bark is used as spice is Cinnamomum zeylanicum. Cinnamomum bark extract was used for hepatoprotective effects against CCl4 induced toxicity in male Wistar rats. Impact of CCl4 toxicity was significantly reduced by the administration of Cinnamomum bark extract (0.01, 0.05 and 0.1mg/kg) for 28 days. Level of liver marker enzymes (aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase) which were increased in serum of rats by the treatment with CCl4, reduced on treatment with Cinnamomum zeylanicum bark extract. Histopathological studies of liver also supported that architecture of liver tissue was normal due to treatment by Cinnamomum zeylanicum bark extract. So it was concluded that Cinnamomum zeylanicum bark extract had potential hepatoprotective effect against CCl4 induced liver damage in rats. The hepatoprotective activity of the same plant was also investigated by Moselhy and Ali. Ethanolic extract of C zeylanicum was investigated against CCl4 induced liver damage in rats. It was indicated that ethanolic extract of C zeylanicum had more hepatoprotective action than water extract against CCl4, by lowering Malondialdehyde (MDA) level and increase the level of antioxidant enzymes like superoxide dismutase and catalase (SOD and CAT). It was concluded that hepatoprotective mechanism of C zeylanicum is due to the free radical scavenging phenol compounds.

Mimosa pudica
Leaves of M. pudica have been reported for hepatoprotective activity against CCl4, induced toxicity in albino rats at the dose of 200mg/kg body weight. Methanolic extract of leaves of M. pudica lowered the serum levels of various biochemical parameters like Serum glutamic oxaloacetate transaminase (SGOT), serum glutamic pyruvates transaminase (SGPT), alkaline phosphatase (ALP), total bilirubin (TBL) and total cholesterol while there was increased level of total protein (TPTN) and albumin (ALB). Methanolic extract of M. pudica showed the significant (p<0.05) hepatoprotective effect against carbotetetrachloride (CCl4) induced hepatic damage in rats. It
was suggested that the phytoconstituents of methanolic extracts of M. pudica may be responsible for significant hepatoprotective activity. These constituents were flavonoids, glycosides and alkaloids. The similar plant was investigated for hepatoprotective potential by Kumarisan et al. Hepatotoxicity was induced by CCl₄. Elevation of serum and tissue marker was found in untreated groups while animal treated with M. pudica showed normal level of enzyme markers. Hence hepatoprotective activity of M. pudica was identified.

**Chamomile recutita. (Matricaria chamomilla)**

Aqueous methanolic extract of C. recutita capitula was administrated in albino mice to evaluate its hepatoprotective effects against paracetamol induced liver toxicity. There was decrease in liver marker enzymes on treatment with aqueous methanolic extract of C. recutita capitula. It proved the hepatoprotective activities of C. recutita capitula. Aqueous extract of M. chamomilla was used to investigate its hepatoprotective effects against paraquat (PQ) induced liver injury in rats. The level of total antioxidant capacity (TAC), total thiol molecules (TTG) level and CAT activity was found increased in rats administered with plant extract. Thus it was concluded that M. chamomilla act as natural antioxidant and is beneficial for the protection of oxidative liver injury in PQ poisoning.

**DISCUSSION**

Herbal medicines are getting popularity in the world due to their effectiveness and minimal side effects. A major bulk of World’s population rely on plants and herbal products as remedy of various disorders especially of liver. Natural products are advantageous over synthetic chemical drugs in various aspects like efficacy, safety and minimal side effects. One of the drawbacks of synthetic drugs is their toxic impact on liver. Although natural products are widely used but still more scientific approach is needed to make them universally acceptable products. Up till now, most of the studies are based on clinical trials on animal models but detailed scientific evaluation and their pharmacological validation is yet to be carried out. Hepatoprotective effects of the plants tested on animals show their clinical testing. Lack of scientific base of pharmaceutical data of herbal medicines make them unable to be recommended as authentic treatment for the liver disorders. The potential of herbal products demands the scientific approach in exploring their pharmaceutical properties so that their use, especially as hepatoprotective, could be regularized.

**CONCLUSION AND RECOMMENDATIONS**

This study indicates the potential hepatoprotective effects of medicinal plants on various hepatotoxins induced liver disorder in animal models. Hepatoprotective activity of these medicinal plants can be attributed to the presence of various phytochemicals such as alkaloids, flavonoids, tannin, sterols, saponin, quercetin, glycosides and phenolic compounds. In some plants, leaves extracts have proven rich in these active compounds. Whereas in some cases extracts taken from whole plant body were found in having these phytochemicals. Current review study is an effort explore the data regarding nature of phytochemicals and their mechanism of action during in-vivo studies for their hepatoprotective effectiveness. It can be concluded that plants have proven hepatoprotective potential which can be utilized in future to prepare effective hepatoprotective drugs. There is still need to investigate the hepatoprotective potential of plants on molecular level so that actual mechanism of phytochemical action can be explored. More studies to find out the scientific basis of herbal treatment can open the new era in developing the drugs which are not only be effective but also free from side effects.

**Contributions of Author:**

Muhammad Zakryya Khan: Manuscript writing as main authorship.

Atta-ur-Rahman: Data collection and organizing the data.

Naeqeb Ullah Jogiizi: Searched literature.

Jhangeer Khan Tareen: Searched literature.

M. Arshad Malik: Contributed in discussion and conclusion/recommendations.

M. Imran Shabir: Contributed in discussion and conclusion/recommendations.

**REFERENCES**


10. Wany Y, Ky H, Keong , Yeap, Rahim AR, Omar RA, et


34. Abdulrahman L, Malik A, Kamel M, Golayel A. Hepatoprotective Efficacy of Chicory alone or combined with Dandelion leaves against induced Liver Damage. Life


