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Fighting Hepatotoxication with CCl_4 of Male Albino Rats using Plant Flowers

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Abstract

This study amied to investigate the effect of white frangipani (Plumeria alba) ,chamomile (Matricaria chamomilla or chamomile recutita capitula),clove (Syzygium aromaticum) ,safflower(Carthmus tinctorius)and their blend on amelioration the hepatotoxicity in Carbon Tetrachloride CCl_4 injected rats .Sixty (60) adult male albino rats, weighing (150±10 g) were divided into (12) groups, each with five rats. One of them was kept as a control (-ve) Group, while the rats of the other eleven groups were injected by 0.2 mg/kg body weight by Carbon Tetrachloride for two weeks (twice weekly) to induce the liver impaired. The flower powders were added at percent of 2 % and 4% from the basal diet and given as single and as a mixture.Glutamic oxaloacetic transaminase (GOT), glutamic pyruvic transaminase (GPT), and alkaline phosphatase (ALP), total bilirubin, direct bilirubin, indirect bilirubin, albumin, total protein , lipid profile : cholesterol(TC), tri-glycerides (TG), high density lipoprotein cholesterol (HDL-c), low density lipoprotein cholesterol (LDL-c), very low density lipoprotein cholesterol (VLDL-c), atherogenic index (AI), urea, creatinine & uric acid assayed and histopatholigical changes were examined. Phenolic compounds and phenolic analysis of flowers were determined .The results indicated that rats treated with CCl_4 recorded significant changes for all above biological and biochemical parameters. Histopathological examination supported these findings and revealed amarked lesion in the inflicted rats . HPLC analysis of safflower,clove,chamomile and white frangipani flowers has revealed the increase contents of these flowers of Phenolic compounds. From the obtained resultsthe mixture of all flower powders enhanced the liver functions, lowering GOT and GPT enzymes. As regards to serum total bilirubin, indirect bilirubin, albumin, globulin, the best treatments are considered that of themixture of all flower powders 4%. Histopathological investigation confirmed the biochemical changes considering the liver and kidney functions.

Key words: Plant flowers -Biochemical analysis -Rats-Hepatoprotective

Introduction:

Liver plays a vital role in maintaining health and in the same time is highly susceptible to disease and injury. The liver diseases are a major cause of illness and death worldwide; Hepatitis and cirrhosis are particularly common liver disorders **(Cubero and Nieto, 2006)and (Ajith *et al*., 2007).**The liver is a large organ, being the largest gland and one of the most vital organs that functions as a centre for metabolism of nutrientsand excretion of waste metabolites **(Ozougwu and Eyo, 2014).** Its primary function is to control the flow and safety of substances absorbed from the digestive system before distribution of these substances to the systemic circulatory system **(Allen, 2002).** A total loss of liver function could lead to death within minutes, demonstrating the liver‘s great importance **(Ozougwu, 2014).**$CCl_4$is a potent environmental hepatotoxin , has been served as a model compound for study of hepatotoxicity and the cellular mechanisms behind oxidative damage and further was used to evaluate the therapeutic potential of drugs and dietary antioxidants **(Basu , 2003 and Prasenjit *et al*., 2006) .**

Herbal drugs had been extensively used for the treatment of various disorders since prehistoric times and even today most of the medicinal preparations are derived from plants. The recognition of herbal drugs is escalating worldwide owing to minor side effects in comparison to synthetic drugs **(Srivastava *et al.*, 2006).** Therefore, there has been considerable interest in the role of complementary and alternative medicines for the treatment of liver disease **(Shen *et al.*, 2009).**

Plumeria alba and *Plumeria acuminate* is small laticiferous tree orshrub is a native of tropical America, commonly known as White Champa Leaf and stem were evaluated for its phytoconstituents, which is used in several traditional medicines to cure various diseases. *P. accuminata, P. alba, P. rubra, P. lancifolea, P. drastic and P. phagidenica* are some of the species with medicinal utility. This shrub has been known to possess analgesic, antitumor, antihelmintic, antioxidant, hepatoprotective, antidiarrhoeal, anticonvulsant, antimicrobial, oestrogenic and antimalarial activity. The leaves and dry stem were extracted with organic solvents and concentrated to obtain residue. Phytochemical screening reveals the presence of alkaloids, cardiac glycosides, flavonoids, steroids, tannins, triterpenoids,

carbohydrates and saponins in the leaf extract of the *Plumeria alba and Plumeria acuminate* **(Gupta, Monika *et al.*,2016***)*.

The phytochemicals and invitro antioxidant activity of *Plumeria alba ,L.* were analysed in aqueous and ethanolic extracts of flowers and leaves by qualitative method and the result confirmed the presence of alkaloids, sterols, terpenoids, flavonoids, amino acids, volatile oils, tannins and phenolic compounds etc., The invitro antioxidant property of aqueous and ethanolic extract of both parts of *Plumeria alba, L.* were evaluated using total antioxidant capacity, reducing power assay, hydrogen peroxide scavenging activity and nitric oxide scavenging activity. Among all the extracts, ethanolic flower extract showed highest antioxidant activity than other extracts. All the results were compared with standard ascorbic acid. In conclusion, the ethanolic extract of *Plumeria alba*, L. flower possess high antioxidant activity which may be due to presence of high content of various phytochemicals**(Nisha and Prasanna, 2014).**

Carthamus tinctorius, L. (Safflower) of family *Asteraceae* is a medicinal plant with great potential. Safflower has been grown mainly for orange-red dye (carthamin) extracted from its flower used in food coloring and flavoring**(Sanskriti *et al.* ,2014)**.Thechemical groups isolated
from*Carthamustinctorius* Wereincludedoils,proteins,minerals,phenolics, flavonoids,alkaloids,lignans,
Carboxylicacids,steroids,polysaccharides,quinochalcone *C*- Glycosid-esand quinone-containingchalcones. It exerted manypharmacological activitiesincluding centralnervous, cardiac, vascular, anticoagulant ,reproductive, gastrointestinal, antioxidant, hypolipidemic, metabolic and many other pharmacological effects (**Al-Snafi, 2015).** Carthamin, safflower yellow are the main constituents in the flower of *C. tinctorius.* Carthamidin, isocarthamidin, hydroxysafflor yellow A, safflor yellow A, safflamin C and luteolin are the main constituents which are obtained from this plant. Caryophyllene, p-allyltoluene, 1-acetoxytetralin and heneicosane were identified as the major components for *C. tinctorius* flowers essential oil (**Asgarpanah and Kazemivash, 2013).**
Clove is the dried reddish brown flower bud of *Syzygium aromaticum* (Family: *Myrtaceae*). Clove represents one of the major vegetal sources of phenolic compounds as flavonoids, hidroxibenzoic acids,

hidroxicinamic acids and hidroxiphenyl propens. It contains volatile oil (14% -21%), tannin (10% - 13%), phenol, sesquoterpene ester and alcohol **(Dashti and Morshedi ,2009).**The most important constituent of clove is the phenylpropene eugenol which gives this spice its pungent, distinctive aroma. Eugenol is the main bioactive compound of clove, Eugenol makes up 70 % to 90 % of the essential oil and 15 % of the dry weight of clove buds **(Gang *et al*.,2001).Kamel *et al*.,(2007)** reported the main constituent's flower buds ofclove essential oil are phenylpropanoids such as carvacrol, thymol, eugenol and cinnamaldehyde.

Chamomile (*Matricaria chamomilla* or *Chamomilla recutita*) is one of the most ancient medicinal herbs known to mankind. It is a member of *Asteraceae*/*Compositae* family and represented by two common varieties *viz*. German Chamomile (*Chamomilla recutita*) and Roman Chamomile (*Chamaemelum nobile*)**(Sharafzadeh and Alizadeh , 2011).**Extracts of chamomile flowers contain a vast amount of detectable chemical constituents, and more than 100 different natural products have been identified so far, including flavonoids, sesquiterpenes and their derivatives, monoterpenes, coumarins and phenolic acids . Many of these small molecules, predominantly the flavonoids, have already been identified as Peroxisome proliferator activated receptor(PPAR) ligands, including genistein ,daidzein , biochanin A formononetin , glycitein , apigenin , chrysin , kaempferol , quercetin , luteolin , diosmetin , and naringenin (**Weidner*et al*. , 2013)**. This study aims to investigate the potential effects of white frangipani *(Plumeria alba)* flowers , safflower*(Carthmus tinctorius)* flowers, cloves *(Syzygium aromaticum*) flowers , chamomile*(Matricaria chamomilla or Chamomilla recutita)*and mixture of all flowers as powders on body weight gain, feed intake, feed efficiency ratio, liver functions, kidney functions, blood glucose and lipid profile, as well as histological properties of liver and kidney in hepatointoxicated rats.

Materials And Methods

Materials

This study was carried out using white frangipani *(Plumeria alba)* flowerswere collected from tree farms in El –Sadat University,Menoufia Governorate, Egypt . While , safflower*(Carthmus tinctorius)* flowerscollected fromcultivated local farmland,Menoufia Governorate, Egypt.Chamomile *(Matricaria chamomilla or Chamomilla recutita)*flowers and cloves *(Syzygium aromaticum*) flowers *were* obtained from the Ministry of Agriculture,Egypt .

Carbon tetra chloride (CCl_4) was obtained from El-Gomhoria Company for chemicals, Cairo, Egypt, as a toxic chemical for liver poisoning according to **Passmore and Eastwood, (1986)**. At the same time, CCl_4 was mixed with paraffin oil by equal volumes and used for induction of liver disease.

Rats: Sixty adult(60) male albino rats, weighting (150± 10 g) were obtained from Research Institute of Ophthalmology, Medical Analysis Department, Giza, Egypt . Rats were housed in wire cages under the normal laboratory conditions and fed on basal diet for 7 consecutive days as adaptation period. Diets were introduced to rat in a special non-scattering feeding cup to avoid loss of feed and contamination. Tap water was provided to rats by means of glass tubes projecting through wire cages from inverted bottlessupported to one side of the cage.

Methods:

Determination of Phenolic compounds and phenolic analysis of dried flowers were determined by HPLC according to the method of **Goupy*et al.*, 1999** at central lab. of Food Technology Research Institue Agric.Res. cent. Egypt.

Experimental design: Sixty (60) (Sprague - Dawley strain) male albino rats were distributed into 12 groups each of 5 rat in which means of rats weight for all groups were nearly equal. All rats were housed in wire cages and fed on the experimental diets for 4 weeks according to the following groups:

Group (1): Control negative group (-ve), in which normal rats were fed on basal diet for 28 days.

Group (2): Control positive group (+), in which ratsinjected by CCl4 at dose of 2 ml per kg of the body weight .Rats were fed on the basal diet for 28 days.

Group (3):A group inflicted with hepatointoxication agent and fed on basal

diet+ 2% white frangipaniflower as powders for 28 days.

Group (4):A group inflicted with hepatointoxication agent and fed on basal diet+ 4% white frangipaniflower as powders for 28 days.

Group (5):A group inflicted with hepatointoxication agent and fed on basal diet + 2% safflowerflower as powdersfor 28 days.

Group (6):A group inflicted with hepatointoxication agent and fed on basal diet + 4% safflowerflower as powders for 28 days.

Group (7):A group infected with hepatointoxication agent and fed on basal diet+ 2% clove flower as powders for 28 days.

Group (8): A group infected with hepatointoxication agent and fed on basal diet+ 4% clove flower as powders for 28 days.

Group (9):. A group inflicted with hepatointoxication agent and fed on basal diet + 2% chamomileflower aspowders for 28 days.

Group (10):A group inflicted with hepatointoxication agent and fed on basal diet + 4% chamomilefloweras powders for 28 days.

Group (11):A group inflicted with hepatointoxication agent and fed on basal diet + 2% mixture of all flower as powders (as equalized proportion) for 28 days.

Group (12):A group inflicted with hepatointoxication agent and fed on basal diet + 4% mixture of all flower as powders (as equalized proportion) for 28 days.

Rats were weighed at the beginning of the experimental then weekly and at the end of the experiment; consumed feed calculated each day.

Diet: The basal diet was prepared according to **Reeves *et al*.,**(**1993).**The vitamin mixture was prepared according to **AIN (1977**). The salt mixture was prepared according alsoto**AIN(1977**).

Organ weights: The internal organs (liver – heart- kidney –spleen – and lungs) were excised, rinsed in chilled saline solution, then blotted on filter paper, and weighed separately to calculate the absolute organs weight.

Biochemical analysis:

At the end of the experiment (4 weeks), the animals were anesthetized with diethyl ether. Incisions were made into the abdomen and blood samples were obtained from the portal vein into (EDTA) centrifuge tubes. Plasma was separated by blood centrifugation at 4000 r .p. m for 10 minutes. The collected samples were analyzed for the biochemical parameters. Enzymatic colorimetric method used to determine, aspartate aminotransferase GOT (AST) , alanine

aminotransferase and alkaline phosphate GPT (ALT) activities according to method described by **Henry (1974) and Yound (1975)**. Alkaline phosphatase determination (ALP) procedure based on colorimetric determination was preformed according to the method of **IFCC** (**1983).** Serum total protein (TP) assessed according to **Henry (1974),** serum albumin (Alb) according to **Doumas *et al*., (1971),** serum total bilirubin (T.Bil) according to **Doumas *et al.*, (1973),** serum direct bilirubin (D.Bil) according to **Chary and Sharma (2004),**serum indirect bilirubin (Ind.Bil) according alsoto **Chary and Sharma (2004)**. Determination of Cholesterol performed according to **Allain (1974),** triglycerides according to **FossatiandPrencipe (1982),** high density lipoprotein (HDL) cholesterolaccording to **Lopez (1977)**. Low density lipoprotein (LDL-c) and very low density lipoprotein (VLDL-c) calculated according to **Lee and Nieman (1996).**Creatinine was determined according to the method described by **Bohmer (1971).** Urea was determined according to the method described by **Patton and Crouch (1977)** and serum glucose according to **Yound (1975)andTietz (1976)**.

Histological examination: Specimens of the internal organs (Liver and kidney) were taken immediately after sacrificing rats and immersed in 10% neutral buffered formalin. The fixed specimens were then trimmed and dehydrated in ascending grades of alcohol, cleared in xylene, embedded in paraffin, sectioned (4-6 Mm thickness), stained with hematoxylin & eosin and examined microscopically**(Carleton , 1979)**.

Statistical analysis: The data were statically analyzed using a computerized Costat Program by one way ANOVA. The results are presented as mean ± SD. Differences between treatments at $p \leq 0.05$ were considered significant **(SAS, 1985)**.

Results And Discussion:

Table(1) represented the chemical analysis of white frangipani, safflower, clove and chamomileflowers**.**The obtained results showed in table (1) It could be noticed that the highest content of total phenols was recorded in clove flowers being 185.20(mg/g) then the other flowers being 30.09 , 25.75 and 22.62(mg/g) for safflower,white frangipani and chamomile**,**respectively.

Table(2) represented the phenolic compounds of white frangipani ,safflower, clove and chamomile flowers(ppm) by HPLC analysis. White frangipani flowers recorded the highest content of Protocatchuic, Chlorogenic and Ferulic . It recorded high content of Ellagic, Catechein, Salycillic, Benzoic , Iso-Ferulic , Coumarin , p-Coumaric , vanillic and pyrogallol. While,safflower flowers showed higher content of 3,4,5-methoxy-cinnamic, Coumarin than white frangipani,chamomile and clove. Chamomile flowers recorded the highest content of P-OH-benzoic, P-coumaric , Ellagic, Salycillic and Cinnamic . It recorded high content of Pyrogallol , Protocatchuic, Catechein , Chlorogenic, Iso-Ferulic , Alpha-coumaric, Benzoic ,3,4,5-methoxy-cinnamic and Coumarin . Clove flowers recorded the highest content of Gallic , Pyrogallol , 4-Aminobenzoic , Catechein, Catechol , Caffeine , Caffeic , Vanillic , Alpha-coumaric ,Benzoic and Iso-Ferulic. It recorded high content of other phenolic compounds. Tables (1&2) results are in agreement with previous findings**: Zahid *et al*.,(2010)**showed thatthe preliminary phytochemical screening revealed the presence of Steroid, Flavonoid and alkaloid in extracts of flower of *P.alba***.** The flavonoids are polyphenolic compounds and reported to exhibit various pharmacological activities **.**Also,**Rahman *et al*.,(2014)**indicated that DPPH assay of methanolic extract of *Plumeria alba* revealed that total phenolic content was found as 173.9 µg ml-1 and 167.3 µg ml-1.Significant free radical scavenging activities of 1.74 mg ml-1and 1.67 mg ml-1 were observed due to the higher phenolic content.

Lim *et al*., (2007)showed that safflower petals also contain flavonoid glycosides. These naturally occurring flavonoids are polyphenolics with antioxidant activities**.**

Al-Snafi (2015) found that the chemical groups isolated from *carthamustinctorius* were included oils, proteins, minerals,phenolics, flavonoids, alkaloids, lignans, carboxylic acids, steroids, polysaccharides, quinochalcone *C*-glycosides and quinone-containing chalcones . It exerted many pharmacological activities**.**

Shan *et al*., (2005) found thatwith regard to the phenolic acids, gallic acid is the compound found in higher concentration (783.50 mg/100 g fresh weight). However, other gallic acid derivates as hidrolizable tannins are present in higher concentrations (2 375.8 mg/100 g) **.Jirovetz*et al* .,(2006**) indicated that other phenolic acids

found in clove are the caffeic, ferulic, elagic and salicylic acids. Flavonoids as kaempferol, quercetin and its derivates (glycosilated) are also found in clove in lower concentrations. **Dashti and Morshedi (2009)** showed that clove represents one of the major vegetal sources of phenolic compounds as flavonoids, hidroxibenzoic acids, hidroxicinamic acids and hidroxiphenyl propens. It contains volatile oil (14% -21%), tannin (10% - 13%), phenol, sesquoterpene ester and alcohol.

McKay andBlumberg (2006) indicated that the main constituents of the chamomile flowers include several phenolic compounds, primarily the flavonoids apigenin, quercetin, patuletin, luteolin and their glucosides.**Sharafzadeh and Alizadeh (2011)** found thatthe biological activity of chamomile is mainly due to the flavonoids apigenin, luteolin, quercetin, patuletin and essential oil constituents such as α-bisabolol and its oxides and azulenes. **Weidner*et al.* , (2013)** showed thatextracts of chamomile flowers contain a vast amount of detectable chemical constituents, and more than 100 different natural products have been identified so far, including flavonoids, sesquiterpenes and their derivatives, monoterpenes, coumarins and phenolic acids.

Table (3)illustrate the effect ofwhite frangipani flowers,chamomileflowers,cloveflowers,safflowerflowersand their mixture on body weight gain (BWG) , feed intake (FI) and feed efficiency ratio (FER) of CCl4 injected rats is shown in table (3). Data illustrated inhepatic rats a gradual increase in BWG, FI and FER when feeding on White frangipani flowers,Safflowerflowers, Chamomileflowers, Clove flowersand their mixture at levels of (2 % and4%). The statistical analysis showed significant positive relations between treatments for BWG, FI and FER.These results are in agreement with those reported by **Nazeah , Abeer (2012) ;Shehata , Rehab (2012)** and **Loutfy ,Amira (2017)**for hepatic rats ,however, **Tessou*et al.*,(2013)** founded thatSub-acute oral administration of the extract of *plumeria alba*at the dose up to 1000 mg/Kg did not induce death or significant changes in body weight.Moreover**,Aboelnaga ,Shimaa (2015)**reported that treating rats which suffer from hepatotoxicity with basal diet containing the three levels (2%, 4% and 6%) from (cardamom, clove and anise) decreased body weight gain%and**Mannaa, Fathia*et* al.,(2015)** revealed that chamomile flowers (CFME) obtained significant decrease in body weight gain.

Table (4) show that effect of white frangipani flowers,safflowerflowers,chamomileflowers,clove flowersand their mixture on organs relative weight of carbon tetrachloride (CCl_4) injected rats. Data illustrated that an increase took place in organs relative weight for control (+) group. The above mentioned flowers and their mixture at level of (2 % and 4%) diets lowered such weights. The statistical analysis showed significant negative relation between treatments plant flowers concentrations and organs relative weight. These results are in agreement with those reported by **Nazeah , Abeer (2012) ;Shehata (2012)** and **Loutfy ,Amira (2017)** for hepatic rats.**Tessou*et al.*,(2013)**found that Sub-acute oral administration of the extract of *plumeria alba* at the dose up to 1000 mg/Kg did not changerelative weight of vital organs, hematological parameters and was not associated with liver and kidney toxicity.**A**lso,**Aboelnaga, Shimaa(2015)**found that treating rats which suffer from hepatotoxicity with basal diet containing the three levels (2%, 4% and 6%) from (cardamom, clove and anise) decreasedliver and kidney weights/body weight% ,however,**Mannaa, Fathia *et al.*,(2015)**indicatedthat chamomile flowers (CFME) showed significant increase in relative liver weight on azathioprine AZA treatment.

Table (5) , Table (6) & Table (7) reflect the effect of white frangipani flowers , chamomileflowers ,clove flowers,safflower - flowersand their mixture on (GPT, GOT,ALP(U/L)), total protein (g/dl), albumin (g/dl), globulin (g/dl), albumin (mg/dl) / globulin (mg/dl), total bilirubin (mg/dl), direct bilirubin (mg/dl) and indirect bilirubin (mg/dl) of CCl_4 injected rats. AST level of hepatic rats fed control diet was 250±1.8 when compared to control (-) group being 99±1.6 U/L. The decreases in aspartame amino transferase (AST) level (mixture 4%), also alanine amino transferase (ALT) level were recorded for experimental diets. Alkaline phosphates (ALP), total protein (g/dl) , albumin (mg/dl), total bilirubin, direct bilirubin and indirect bilirubin improved when rats fed on the above mentioned flower powders and their mixture . These results are in agreement with those reported by **Loutfy ,Amira (2017)** for hepatic rats,however,**Chowdhur *et al.*,(2010)** found that *Plumeria alba* methanolic extract possess active hepatoprotective activity.

Abdel-Rahman,Manal and Ashraf(2006) found that albumin levels declined in positive control diet group due to the hepatic damage induced, and levels were found to be enhanced by cloves treatment . **Abdel-Wahhab and Aly** (**2005)**&**El-Segaey *etal*., (2007)** studied the antioxidant effects of cardamom and cloves on intoxicated rats by ethanol and found that both additives reduced significantly liver enzymes.**Parameshae*t al.*, (2011)** showed that the potent antioxidant and its correlative hepatoprotective activity of the methanolic extract of safflower and isolated constituent dehydroabietylamine are therefore attributed to its antioxidant and free radical scavenging activities **.Wu *et al*., (2013)**demonstrated that carthamus red may serve as a candidate with strong a hepatoprotective effect and antioxidant activity in liver damage.Moreover**Saad, Entsare*t al.*,(2015)**confirmed that clove or green tea administration has strong hepatoprotective effects against induced hepatotoxicity in rats via antioxidant mediated mechanism. **Aboelnaga ,Shimaa (2015)** found thattreating rats which suffering from hepatotoxicity with basal diet containing the three levels (2%, 4% and 6%) from (cardamom, clove and anise) decreased serum AST, ALT, ALP.

El-massry *et al*., (2009) showed that chamomile also induced hepatoprotective activity against CCL4 by improving ALT, AST, ALP, TBIL, LDH, TP , ALB, GR, GPX, SOD, malondialdehyde and plasma hemoglobin levels in some organs .**Kumar *et al*.,(2012)** observed that extract of chamomile has reversal effects on the levels of serum bilirubin,glycogen and thiobarbutiric acid reactive substances in paracetamol hepatotoxicity thus,the study suggested itshepatoprotectiveand/or hepatostimulant activity.**Ramadan and Emam (2012)** indicated that *Matricaria chamomilla* extract effectively reduced the oxidative stress induced by streptozotocin and potential reduction in blood sugar level.Also,**Al-Baroudi, Dalal *et al*., (2014)** recommended that intake of *Chamomile capitula* extract as a herbal tea may be beneficial for patients who suffer from liver diseases and oxidative stress antioxidant enzymes because it decreased the elevated serum levels of liver enzymes (AST, ALT and ALP), total bilirubin and lactate dehydrogenase enzyme and increased serum total protein, albumin, when compared to the corresponding control positive groups**.**

Table (8) illustrate the effect of white frangipani flowers,chamomileflowers,clove flowers,safflowerflowersand their mixture on urea (mg/dl), creatinine (mg/dl) and uric acid of hepatointoxicated . Serum creatinine level for rats of control (+) diet was 1.12 ±0.09 mg/dl. A marked decrease of serum creatinine was observed, along with feeding hepatic rats on above mentioned flowers and their mixture. Urea and Uric acid showed a paralled decreases when rats fed on plant flowers mixture (2 & 4%). But the best transactions recoreded when rat fed the mixture (4%). However these results (Table 6) agree with that reported by **Loutfy ,Amira (2017)** for hepatic rats.**Zhu *et al.*, (2003)** who found that hydroxysafflor yellow A (HSYA) is thought to be one of the main active ingredients or components of floral pigments in safflower. It had a neuroprotective and hepatoprotective effects at doses as low as 6.0 mg/kg in rats.

Abozidand EL-Sayed (2013) suggested that acetone extract of clove and clove essential oil has a liver-protective and kidney-protective effects against H2O2induced oxidative stress and bad effects on both liver and kidney and possess *in vitro* antioxidant activities.**Aboelnaga,Shimaa ,(2015)** foundthat treating rats which suffer from hepatotoxicity with basal diet containing the three levels (2%, 4% and 6%) from (cardamom, clove and anise) decreaseduric acid, urea nitrogen, creatinine**.**

Table (9)show the effect of white frangipani flowers,chamomileflowers,clove flowers,safflowerflowersand their mixture on serum total cholesterol & triglycerides (TG), high density lipoprotein cholesterol (HDL-c), low density lipoprotein cholesterol (LDL-c), veryLow density lipoprotein cholesterol (VLDL-c) and atherogenic index (AI) of CCl4 injected rats. Data revealed pronounced decreases of serum (TC), (TG), (LDL-c), (VLDL-c) & (AI) when rat feed (mixture 4%), while HDL was raised.These results (Table 9) are in agreement with those found by **Loutfy ,Amira (2017)** for hepatic rats.

Rahman *et al*.,(2014) suggested that methanolic flower extracts of *Plumeria alba* and *P. rubra* were of in vitro antioxidant potential, improving cytotoxicity and showing hypolipidemic activities.

Arpornsuwan*et al*.,(2010) showed that after safflower treatment for 14 and 30 days, a significant reduction in total cholesterol and total cholesterol/HDL- cholesterol and a significant induction in HDL-

cholesterol were observed in the hypercholesterolemic rats treated with the dichloromethane extract.

El-Segaey *et al.*, (2007) reported decreased serum triglyceride and cholesterol levels in cardamom and clove pretreated rats reflecting their protective hepatocellular effects.**Aboelnaga ,Shimaa (2015)** showed that treating rats which suffer from hepatotoxicity with basal diet containing the three levels (2%, 4% and 6%) from (cardamom, clove and anise) decreased cholesterol, triglycerides, LDL-c, VLDL-cwhile HDL-c increased.

El-massry *et al.*, (2009) stated that the infusion blend of chamomile and other aromatic plantswere effective for the lipid profile by improving lipid metabolism.

Table (10) results indicate the effect of white frangipani flowers,safflowerflowers,chamomileflowers,clove flowersand their mixture on serum glucose in CCl_4 injected rats. Results illustrated a pronounced decrease of blood glucose level followed feeding on white frangipani flowers,chamomileflowers,clove flowers,safflowerflowersand their mixture . Data proved the desirable effect of feed (plant flowersand their mixture) on blood glucose. Blood glucose was lower in the all supplemented diets compared to control (+ve). Group G12 (4% mixture) revealed lowest values compared to others groups.These results (Table 8) are in agreement with those reported by**Rajanarayana *et al.*,(2001)** who found that *Plumeria alba* flowers exhibited hypoglycemic activity because of its content of flavonoids.

Safflower extract may also have anti-diabetic properties **(Asgary *et al.*, 2012).** Also , **Mandade (2012)** reported the increase in the size of isletsof Langerhan cell with the *Carthamus tintorius* administration.**Qazi *et al.*,(2014)** revealed that *Carthamus tinctorius* exerted asignificant hypoglycemic effect at 200 mg/kg and 300mg/kg doses as compared to diabetic control group. Insulin levels were significantly increased in *Carthamus tinctorius* treated groups as compared to diabetic control . **Parivash*et al.*,*(*2014*)*** reported that after alloxan injection increase in alanine and aspartate transferase occurs . The oil obtained from the seeds of *Carthamus tinctorius* is rich source of mono and polyunsaturated fatty acid regulate insulin secretion response and glucose homeostasis. The higher activity of enzymes like glutamic

pyruvic transaminase, serum glutamic transaminase and ALP shows that diabetes associated with the liver dysfunction. It has been observed that 28 days doses of *Carthamus tinctorius* oil recovered the activities of the above enzymes in the alloxan induced diabetic rats**.**

Ravi *et al*.,(2004) showed that clove has the ability to decrease the oxidative stress in diabeticrats**.Aboelnaga ,Shimaa ,(2015)** indicated thattreating rats which suffer from hepatotoxicity with basal diet containing the three levels (2%, 4% and 6%) from (cardamom, clove and anise) decreased glucose.

El-massry *et al*., (2009)proved that the infusion blend of chamomile and other aromatic plants is safe and effective in controlling hyperglycemic effect of streptozotocin STZ rats by amelioration of serum glucose level.**Kaseb, Fatemeh *et al*.,(2018)** found that chamomile has potential desirable effects on serum levels of TC, LDL-C and Cr in patients with type 2 diabetes taking oral hypoglycemic agent.

Histopathologically (Photoes1-24), show pronounced changes took place in liver & kidneys structures due to injection with CCl_4 and after feeding on experimental flower diets. **Oryan *et al*., (2014),**found that injection with alloxan resulted in severe necrotic changes in the pancreatic islets, especially in the central area of the islets. Liver of the treated diabetic rats revealed significant changes due to diabetes mellitus meanwhile, improvement of the hepatic tissue compared to those of the untreated diabetic rats recorded when inflicted rats recerived extract of colocynth.

In present work (Photoes 1-24) supplementing diet with (plant flowersand their mixture) improved liver and kidneys structures Such improvements were achieved by feeding hepatic rats with (2% and 4%) plant flowersand their mixture.Anyhow microscopically, liver, kidney of rat from control (-ve) group showed normal structures.While, hepatic rat from control (+ve) group showed atrophy and vacuolations in liver and kidney .Meanwhile, liver and kidney of rat fed on flower diets revealed no or slight histopathological changes indicating regaining more or less restoration of the original structure.

Table (1): Chemical analysis of white frangipani, safflower, clove and chamomile flowers (mg/g)

Samples	Total phenols(mg/g)
White frangipani flowers	25.75
Safflower flowers	30.09

Clove flowers	185.20
Chamomile flowers	22.62

Table (2):Phenolic compounds of white frangipani ,safflower, clove and chamomile flowers(ppm) by HPLC analysis

Phenolic compounds (ppm)	Samples			
	White frangipani	Safflower	Chamomile	Clove
Gallic	19.40	38.71	36.69	2422.55
Pyrogallol	128.68	409.83	171.22	2026.90
4-Aminobenzoic	33.10	8.02	18.14	58.77
Protocatchuic	1605.50	140.23	325.03	238.82
Catechein	251.05	188.40	173.06	469.50
Chlorogenic	1269.24	182.09	282.46	282.12
Catechol	78. 56	168.21	68.24	287.23
Caffeine	43.75	42.45	19.61	598.80
P-OH-benzoic	59.17	105.28	2338.11	498.93
Caffeic	12.58	8.22	24.33	128.75
Vanillic	36.21	57.58	35.38	99.48
P-coumaric	47.10	39.11	413.03	18.42
Ferulic	643.52	30.36	31.66	72.17
Iso-Ferulic	21.61	6.71	81.23	84.29
Ellagic	3815.48	251.81	5275.00	1406.40
Alpha-coumaric	2.45	3.13	5.74	7.30
Benzoic	468.26	475.15	732.05	1041.81
Salycillic	509.83	170.20	2605.07	589.06
3,4,5-methoxy-cinnamic	24.39	264.88	74.73	45.17
Coumarin	13.42	105.03	31.69	29.51
Cinnamic	4.29	31.27	116.48	11.50

Table(3): Effect of experimental flower powders onfeed intake (FI) (g/day/rat) , body weight gain (BWG) (g/day/rat) and feed efficiency ratio (FER) of hepatointoxicated rats

Parameters / Groups	FI g/day/rat	BWG g/day/rat	FER
	Mean±SD	Mean±SD	Mean±SD
G1: Control(-ve)	14.50^{a}±1.20	0.3348^{a}±0.092	0.0231^{a}±0.0035
G2: Control (+ve)	7.50^{g}±0.50	0.0129^{f}±0.001	0.0017^{f}±0.0001
G3:White frangipani 2%	10.00^{e}±0.02	0.0937^{cde}±0.002	0.0094^{cd}±0.0004
G4:White frangipani 4%	12.80^{b}±0.12	0.1728^{b}±0.02	0.0135^{b}±0.0012
G5: Safflower 2%	8.60^{f}±0.04	0.0243^{f}±0.003	0.0028^{f}±0.0012
G6: Safflower 4%	11.90^{c}±0.40	0.0971^{cde}±0.001	0.0082^{d}±0.0007
G7: Clove 2%	10.40^{de}±0.11	0.1116^{cd}±0.0011	0.0107^{c}±0.0002
G8: Clove 4%	12.50^{b}±0.06	0.1406^{bc}±0.012	0.0112^{c}±0.0003

G9:Chamomile 2%	8.80^{f}±0.05	0.0414 ^{ef}±0.002	0.0047 ^{e}±0.0002
G10:Chamomile 4%	9.01 ^{f}±0.10	0.0485 ^{def}±0.005	0.0054 ^{e}±0.0003
G11: Mixture 2%	9.89 ^{e}±0.01	0.0643 ^{def}±0.01	0.0065^{e}±0.0005
G12: Mixture 4%	10.90^{d}±0.05	0.1004 ^{cde}±0.006	0.0092 ^{cd}±0.0001
LSD:	**0.5838**	**0.0439**	**0.0016**

Means in the same row with different litters are significantly different at ($p \leq 0.05$).

Table(4): Effect of experimental flower powders on relative organs weight % (liver, kidneys , heart ,spleen and lungs) of hepatointoxicated rats

Parameters / Groups	Liver	Kidneys	Heart	Spleen	Lungs
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
G1: Control(-ve)	2.75 ^{h}±0.11	0.69^{h}±0.01	0.40^{l}±0.001	0.28^{i}±0.02	0.77^{j}±0.03
G2: Control (+ve)	4.45^{a}±0.015	1.15^{a}±0.04	0.80^{a}±0.01	0.87^{a}±0.1	1.30^{a}±0.05
G3:White frangipani 2%	3.39^{e}±0.012	0.90^{d}±0.04	0.76^{b}±0.025	0.62^{b}±0.03	0.97^{d}±0.011
G4:White frangipani 4%	3.24^{f}±0.02	0.85^{e}±0.005	0.58^{d}±0.01	0.57^{c}±0.021	0.91^{ef}±0.003
G5:Safflower2%	3.71^{d}±0. 20	1.10^{b}±0.006	0.69^{c}±0.04	0.52^{cd}±0.013	1.13^{b}±0.021
G6: Safflower 4%	3.17^{f}±0.03	0.82^{f}±0.012	0.48^{g}±0.02	0.38^{e}±0.011	0.82^{i}±0.02
G7: Clove 2%	3.45^{e}±0.001	0.88^{d}±0.002	0.56^{e}±0.011	0.41^{e}±0.004	0.87^{gh}±0.004
G8: Clove 4%	3.38^{e}±0.001	0.84^{ef}±0.003	0.54^{e}±0.003	0.40^{e}±0.003	0.86^{h}±0.01
G9:Chamomile2%	4.28^{b}±0.014	1.03^{c}±0.011	0.55^{e}±0.004	0.55^{cd}±0.001	1.06^{c}±0.012
G10:Chamomile 4%	3.46^{e}±0.01	0.88^{d}±0.01	0.44^{h}±0.001	0.45^{e}±0.01	0.89^{fg}±0.006
G11: Mixture 2%	4.14^{c}±0.03	1.02^{c}±0.02	0.50^{f}±0.005	0.50 ^{d}±0.015	0.99^{d}±0.014
G12: Mixture 4%	2.96^{g}±0.01	0.77 ^{g}±0.02	0.44^{h}±0.002	0.43^{e}±0.002	0.93^{e}±0.013
LSD:	**0.0994**	**0.0235**	**0.0201**	**0.0456**	**0.0222**

Means in the same row with different litters are significantly differentat ($p \leq 0.05$).

Table (5):Effect of experimental flower powders on serum aspartate aminotransferase (AST),alanine aminotransferase(ALT) and alkaline phosphatase (ALP) U/L of hepatointoxicated rats

Parameters / Groups	AST U/L	ALTU/L	ALP U/L
	Mean±SD	Mean±SD	Mean±SD
G1: Control(-ve)	99.00^{k}±1.60	44 .00^{l}± 1.80	132.^{l}± 2.10
G2: Control (+ve)	250.00^{a}±1.80	95.00^{a}± 2.30	310.00^{a}± 1.90
G3:White frangipani 2%	187.00^{b}± 2.00	81.50^{d}± 0.25	290.00^{b}± 1.30
G4:White frangipani 4%	153.00^{l}±0.60	76.00^{f}± 0.59	230.75 ^{k}± 2.08
G5: Safflower 2%	174.00^{d}± 0.80	82.80^{c}± 0.39	287.00^{c}± 1.25
G6: Safflower 4%	165.00^{e}± 0.09	79.00^{e}± 1.09	284 .00^{d}± 1.60
G7: Clove 2%	183.60^{c}± 0.50	74.80^{g}± 1.03	279.00^{f}± 0.50
G8: Clove 4%	159.75 ^{g}± 0.90	68.00^{l}± 0.54	242.25 ^{j}± 1.58
G9:Chamomile 2%	163 .00^{f}± 1.00	86.00^{b}± 1.50	280.60^{e}± 1.01
G10:Chamomile 4%	155 .00^{h}± 2.00	66 .00^{j}± 0.86	258.00^{l}± 2.00
G11: Mixture 2%	160.00^{g}± 1.20	69.80^{h}± 0.90	274.20^{g}± 1.30

G12: Mixture 4%	140.00 ^{j}± 1.30	64 .00^{k}± 0.60	269.20^{h}± 1.00
LSD:	**1.0402**	**1.0327**	**0.8456**

Means in the same row with different litters are significantat($p \leq 0.05$)

Table (6):Effect of experimental flower powders on total protein,albumin ,globulin (mg/dl) and Alb/Glob ratio of hepatointoxicated rats

Parameters / Groups	Total protein mg/dl	Albumin mg/dl	Globulin mg/dl	Alb/Glob ratio
	Mean±SD	**Mean±SD**	**Mean±SD**	**Mean±SD**
G1: Control(-ve)	8.60^{a}±0.09	5.60^{a}± 0.20	3.00^{d}±0.003	1.86 ^{a}±0.10
G2: Control (+ve)	7.00^{f}±0.32	2.50^{e}±0.50	4.50^{a}±0.50	0.50^{f}±0.18
G3:White frangipani 2%	7.54 ^{e}±0.02	4.06 ^{cd}±0.02	3.48 ^{b}±0.002	1.16 ^{d}±0.01
G4:White frangipani 4%	7.95 ^{cd}±0.25	4.79 ^{b}±0.012	3.16 ^{c}±0.011	1.51 ^{b}±0.02
G5: Safflower 2%	8.06 ^{c}±0.001	3.93 ^{d}±0.025	4.13 ^{c}±0.01	0.95 ^{e}±0.20
G6: Safflower 4%	8.28 ^{b}±0.03	4.78 ^{b}±0.01	3.50^{b}±0.001	1.36 ^{c}±0.032
G7: Clove 2%	7.95 ^{cd}±0.025	4.31 ^{c}±0.08	3.64 ^{b}±0.06	1.18 ^{d}±0.001
G8: Clove 4%	8.30^{b}±0.05	4.75 ^{b} ±0.01	3.55 ^{b}±0.015	1.33 ^{c}±0.03
G9:Chamomile 2%	7.60 ^{e}±0.017	4.09 ^{cd}±0.007	3.51 ^{b}±0.013	1.16 ^{d}±0.02
G10: Chamomile 4%	8.08 ^{c}±0.001	4.62 ^{b}±0.02	3.46 ^{b}±0.004	1.33 ^{c}±0.01
G11: Mixture 2%	7.80^{d}±0.04	4.77 ^{b}±0.013	3.03 ^{d}±0.02	1.75 ^{b}±0.015
G12: Mixture 4%	7.97 ^{cd}±0.03	4.96 ^{b}±0.04	3.01 ^{d}±0.005	1.64 ^{b}±0.05
LSD:	**0.1480**	**0.2494**	**0.2395**	**0.1151**

Means in the same row with different litters are significantly different at ($p \leq 0.05$).

Table(7):Effect of experimental flower powders on serum total bilirubin,direct bilirubin and indirect bilirubin of hepatointoxicated rats

Parameters / Groups	Total bilirubin mg/dl	Direct bilirubin mg/dl	Indirect bilirubin mg/dl
	Mean±SD	**Mean±SD**	**Mean±SD**
G1: Control(-ve)	0.22 ^{e}±0. 20	0.01 ^{f}±0.009	0.21 ^{h}±0.02
G2: Control (+ve)	0.99 ^{a}±0.05	0.16 ^{a}±0.01	0.83 ^{a}±0.03
G3:White frangipani 2%	0.71 ^{bcd}±0.006	0.09 ^{bc}±0.001	0.62 ^{f}±0.01
G4:White frangipani 4%	0.67 ^{cd}±0.004	0.07 ^{d}±0.004	0.60 ^{e}±0.001
G5: Safflower 2%	0.69 ^{bcd}±0.001	0.09 ^{bc}±0.0019	0.60 ^{e}±0.002
G6: Safflower 4%	0.69 ^{bcd}±0.002	0.07 ^{d}±0.005	0.62^{e}±0.004
G7: Clove 2%	0.78^{bc}± 0.008	0.07^{d}±0.0071	0.71^{c}±0.01
G8: Clove 4%	0.73^{bcd}±0.007	0.07 ^{d}±0.007	0.66^{d}±0.02
G9:Chamomile 2%	0.65^{cd}±0.002	0.088 ^{bc}±0.0025	0.56^{f}±0.006
G10: Chamomile 4%	0.62^{d}±0.003	0.062 ^{e}±0.0012	0.56 ^{f}±0.012
G11: Mixture 2%	0.82 ^{b}±0.011	0.092 ^{b}±0.002	0.73^{b}±0.002

G12: Mixture 4%	$0.58^{d}\pm0.01$	$0.084^{c}\pm0.0031$	$0.45^{g}\pm0.009$
LSD:	**0.0957**	**0.0052**	**0.01499**

Means in the same row with different litters are significantly different at ($p \leq 0.05$).

Table(8):Effect of experimental flower powders on serum urea nitrogen,creatinine and uric acid of hepatointoxicated rats

Parameters / Groups	**Urea mg/dl**	**Creatinine mg/dl**	**Uric acid mg/dl**
	Mean±SD	**Mean±SD**	**Mean±SD**
G1: Control(-ve)	$28.40^{f}\pm0.40$	$0.54^{f}\pm0.04$	$1.20^{f}\pm0.50$
G2: Control (+ve)	$58.00^{a}\pm2.00$	$1.12^{a}\pm0.09$	$6.90^{a}\pm0.40$
G3:White frangipani 2%	$40.60^{bc}\pm0.06$	$0.94^{b}\pm0.018$	$4.53^{c}\pm0.013$
G4:White frangipani 4%	$39.00^{d}\pm0.20$	$0.79^{d}\pm0.002$	$3.34^{de}\pm0.004$
G5:Safflower 2%	$41.50^{b}\pm0.45$	$0.89^{c}\pm0.005$	$4.44^{c}\pm0.03$
G6:Safflower 4%	$40.00^{cd}\pm0.05$	$0.74^{de}\pm0.004$	$3.67^{d}\pm0.02$
G7: Clove 2%	$37.80^{e}\pm0.14$	$0.88^{c}\pm0.002$	$4.77^{bc}\pm0.02$
G8: Clove 4%	$35.20^{f}\pm0.25$	$0.78^{d}\pm0.006$	$4.45^{c}\pm0.021$
G9:Chamomile 2%	$37.20^{e}\pm0.10$	$0.87^{c}\pm0.001$	$5.01^{b}\pm0.05$
G10:Chamomile 4%	$36.80^{e}\pm0.07$	$0.86^{c}\pm0.003$	$3.40^{de}\pm0.012$
G11: Mixture 2%	$33.40^{g}\pm1.00$	$0.87^{c}\pm0.001$	$4.32^{c}\pm0.013$
G12: Mixture 4%	$31.60^{h}\pm0.30$	$0.72^{e}\pm0.002$	$3.18^{e}\pm0.01$
LSD:	**1.0223**	**0.0445**	**0.3288**

Means in the same row with different litters are significantly different at ($p \leq 0.05$).

Table(9):Effect of experimental flower powders on serum total cholesterol (TC) mg/dl , triglycerides(TG)mg/dl, very low density lipoprotein (VLDL) , low density lipoprotein (LDL), high density lipoprotein (HDL) mg/dl& atherogenic index(AI) of hepatointoxicated rats

Parameters / Groups	**T C** mg/dl	**T G** mg/dl	**V L D L** mg/dl	**LDL** mg/dl	**HDL** mg/dl	**AI**
	Mean±SD	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**
G1: Control(-ve)	$99.00^{k}\pm2.00$	$55.00^{l}\pm2$	$11.00^{h}\pm2.00$	$20.00^{k}\pm2.70$	$68.00^{a}\pm2.00$	$0.46^{g}\pm0.20$
G2: Control (+ve)	$158.00^{a}\pm2.00$	$170.00^{a}\pm1.80$	$34.00^{a}\pm1.50$	$126.00^{a}\pm1.90$	$25.00^{l}\pm1.28$	$6.40^{a}\pm1.05$
G3:White frangipani 2%	$143.00^{f}\pm0.10$	$146.00^{f}\pm1.30$	$29.20^{de}\pm0.21$	$59.80^{f}\pm2.00$	$54.00^{g}\pm1.04$	$1.65^{cdef}\pm0.031$
G4:White frangipani 4%	$129.80^{l}\pm1.00$	$139.00^{h}\pm1.40$	$27.80^{f}\pm0.28$	$46.00^{l}\pm0.50$	$56.00^{f}\pm1.00$	$1.32^{def}\pm0.003$
G5: Safflower 2%	$144.00^{f}\pm0.30$	$142.00^{g}\pm0.68$	$28.40^{ef}\pm0.09$	$70.60^{e}\pm0.10$	$45.00^{k}\pm1.12$	$2.20^{bc}\pm0.012$
G6: Safflower 4%	$136.00^{g}\pm0.65$	$132.00^{i}\pm1.20$	$26.40^{g}\pm0.12$	$50.60^{g}\pm0.60$	$59.00^{d}\pm0.25$	$1.31^{def}\pm0.001$
G7: Clove 2%	$156.00^{d}\pm1.80$	$155.00^{c}\pm0.35$	$31.00^{bc}\pm0.06$	$73.00^{d}\pm0.15$	$52.00^{h}\pm1.01$	$2^{bcd}\pm0.05$
G8: Clove 4%	$134.00^{h}\pm1.20$	$130.00^{j}\pm0.50$	$26.00^{g}\pm0.13$	$48.00^{h}\pm0.80$	$60.00^{c}\pm0.42$	$1.23^{ef}\pm0.05$
G9:Chamomile 2%	$169.00^{b}\pm1.00$	$154.00^{d}\pm0.46$	$30.80^{bc}\pm0.04$	$89.20^{b}\pm1.40$	$49.00^{l}\pm0.91$	$2.44^{b}\pm0.01$
G10: Chamomile 4%	$165.00^{c}\pm1.95$	$149.00^{e}\pm1.00$	$29.80^{cd}\pm0.32$	$77.20^{c}\pm1.20$	$58.00^{e}\pm0.89$	$1.84^{bcde}\pm0.04$
G11: Mixture 2%	$149.00^{e}\pm1.40$	$158.00^{b}\pm1.15$	$31.60^{b}\pm0.42$	$70.40^{e}\pm0.03$	$47.00^{j}\pm1.00$	$2.17^{bc}\pm0.02$
G12: Mixture 4%	$127.00^{j}\pm0.50$	$128.00^{k}\pm1.00$	$25.60^{g}\pm0.10$	$40.40^{j}\pm1.80$	$61.00^{b}\pm0.50$	$1.08^{f}\pm0.09$
LSD:	**1.154**	**0.8784**	**1.0699**	**1.475**	**0.7633**	**0.4997**

Means in the same row with different litters are significantly different at ($p \leq 0.05$).

Table (10) : Effect of experimental flower powders and their mixture on serum glucose of hepatointoxicated rats

Parameters / Groups	Serum glucose mg/dl
	Mean±SD
G1: Control(-ve)	79 .00^{l}±1.00
G2: Control (+ve)	160 .00^{a}±2.00
G3:White frangipani 2%	132.00^{b}±2.00
G4:White frangipani 4%	118.00^{f}±1.30
G5: Safflower 2%	105.00^{g}±0.90
G6: Safflower 4%	103.00^{h}±1.40
G7: Clove 2%	126 .00^{d}±1.60
G8: Clove 4%	123.00^{e}±1.01
G9:Chamomile 2%	129.00^{c}±0.80
G10: Chamomile 4%	99 .00^{k}±1.20
G11: Mixture 2%	101.00^{l}±0. 50
G12: Mixture 4%	95.00^{k}±1.50
LSD:	**0.7812**

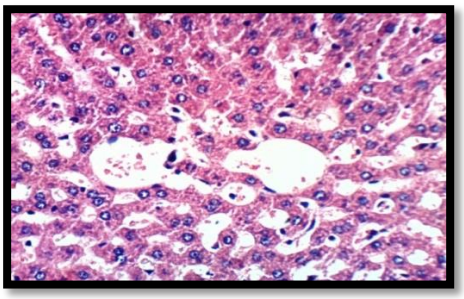

Photo (1): Liver of rat from group 1 control (-) showing the normal histological structure of hepatic lobule **(H & E X 400).**

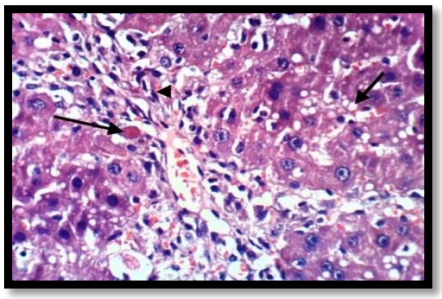

Photo (2): Liver of rat from group 2 control (+) steatosis of hepatocytes, apoptosis of hepatocytes and fibroblasts proliferation **(H & E X 400).**

Means in the same row with different litters are significantly different at ($p \leq 0.05$).

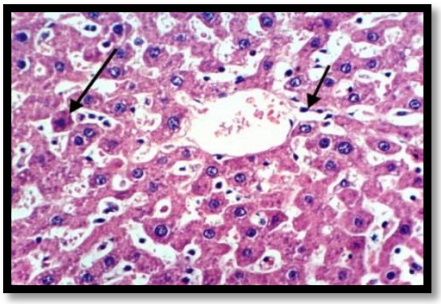

Photo (3): Liver of rat from group 3 white frangipani flower powders at 2% showing Kupffer cells activation and necrosis of sporadic hepatocytes**(H & E X 400)**.

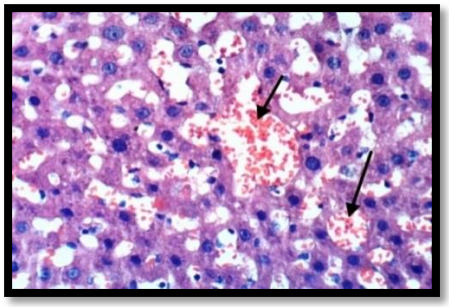

Photo (4): Liver of rat from group 4 white frangipaniflower powders at 4% showing slight congestion of central vein and hepatic sinusoids**(H & E X 400).**

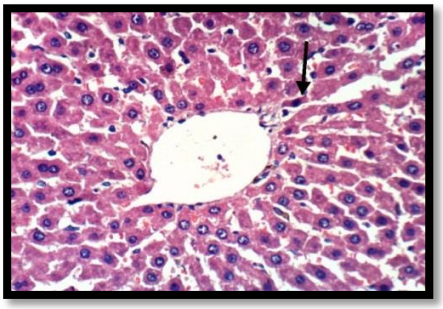

Photo (5): Liver of rat from group 5 safflowerflower powders at 2% showing necrosis of sporadic hepatocytes **(H & E X 400)**.

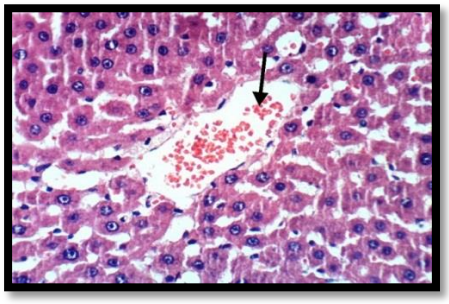

Photo (6): Liver of rat from group 6 safflowerflowerpowders at 4% showing slight congestion of central vein **(H & E X 400)**.

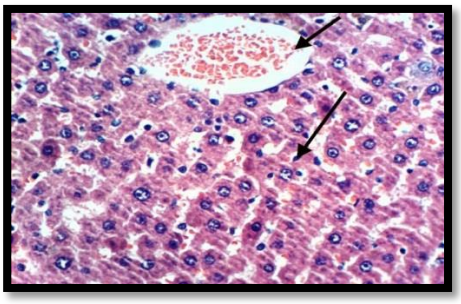

Photo (7): Liver of rat from group 7 cloves flower powders at 2%showing slight congestion of central vein and activation of Kupffer cells **(H & E X 400).**

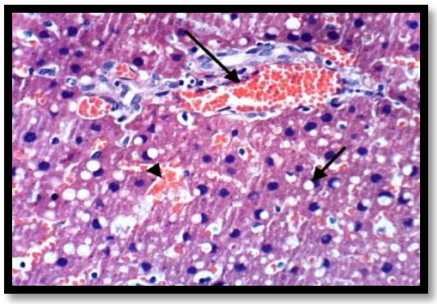

Photo (8): Liver of rat from group 8 clovesflower powders at 4 % showing steatosis of hepatocytes, congestion of hepatoportal blood vessel and hepatic sinusoids **(H & E X 400).**

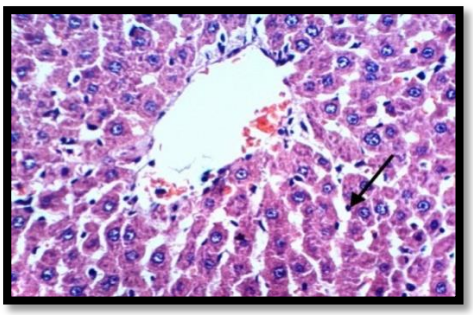

Photo (9): Liver of rat from group 9 chamomilflower powders at 2%showing Kupffer cells activation **(H & E X 400).**

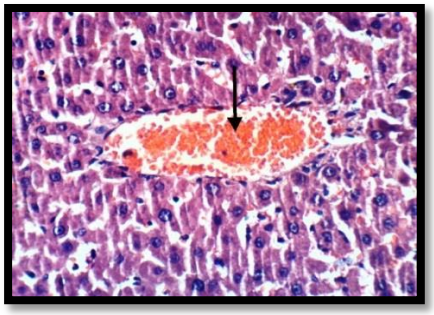

Photo (10): Liver of rat from group 10 Chamomileflower powders at 4%showing congestion of central vein **(H & E X 400).**

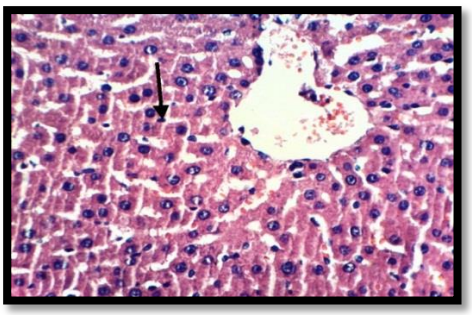

Photo (11): Liver of rat from group 11 mixture of all flower powders at 2% showing Kupffer cells activation **(H & E X 400).**

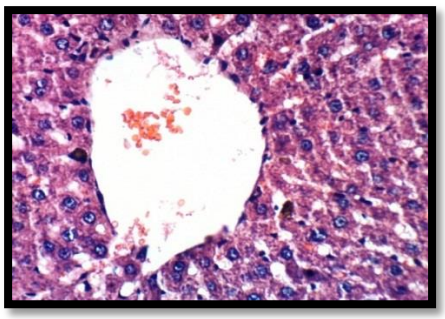

Photo (12): Liver of rat from group 12 mixture of all flower powders at 4% showing no histopathological changes **(H & E X 400).**

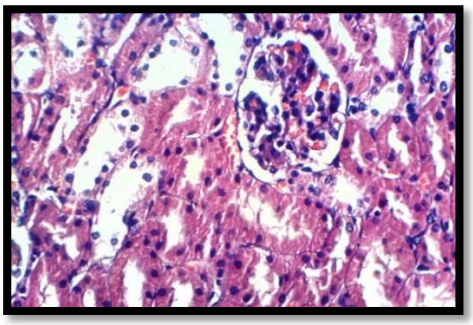

Photo (13): Kidney of rat from group 1(control -ve) showing the normal histological structure of renal parenchyma **(H & E X 400).**

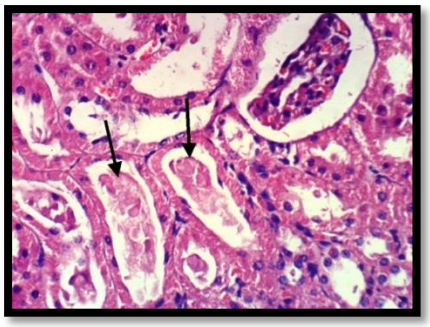

Photo (14): Kidney of rat from group 2 (control +ve) showing proteinaceous material in the lumen of renal tubules **(H & E X 400).**

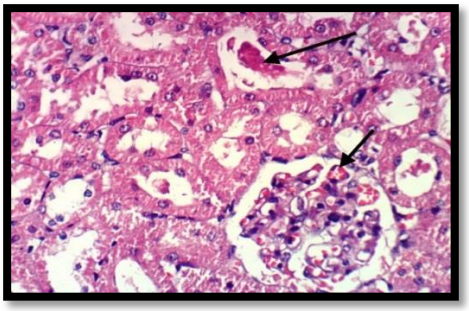

Photo (15): Kidney of rat from group white frangipaniflower powders at 2%showing slight congestion of glomerular tuft and proteinaceous material in the lumen of renal tubules **(H & E X 400).**

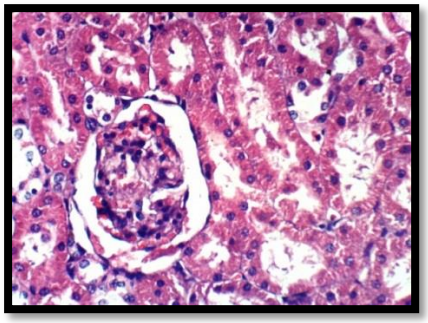

Photo (16): Kidney of rat from group 4 white frangipaniflower powders at4% showing no histopathological changes **(H & E X 400).**

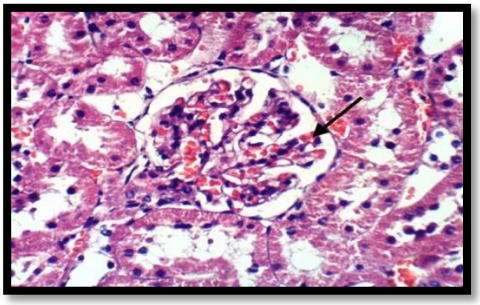

Photo (19): Kidney of rat from group **7** cloves flowerpowders at 2%showing congestion of glomerular tuft **(H & E X 400).**

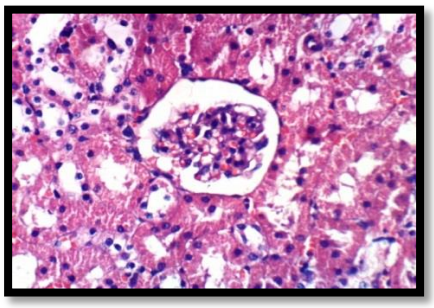

Photo (20): Kidney of rat from group 8 cloves flower powders at 4% showing no histopathological changes **(H & E X 400).**

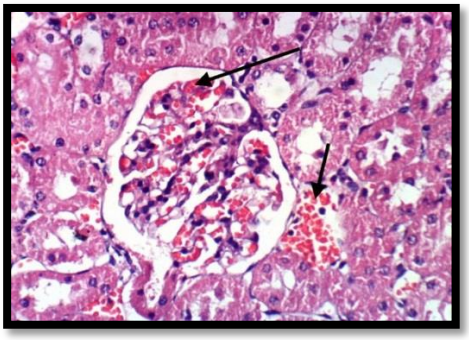

Photo (21): Kidney of rat from group 9 chamomileflower powders at 2% showing congestion of intertubular renal blood vessels and glomerular tuft **(H & E X 400).**

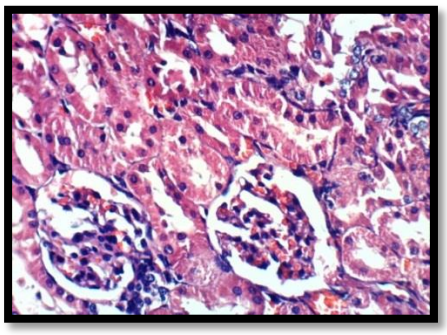

Photo (22): Kidney of rat from group 10 chamomileflower powders at 4%showing no histopathological changes **(H & E X 400).**

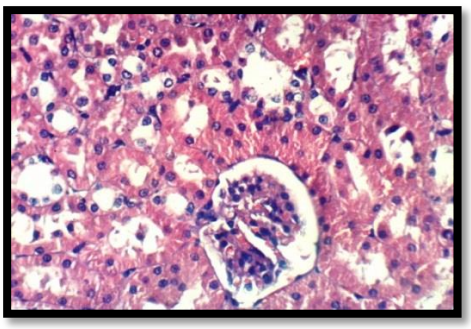

Photo (23): Kidney of rat from group Kidney of rat from group 11 mixture of all flower powders at 2%showing no histopathological changes **(H & E X 400).**

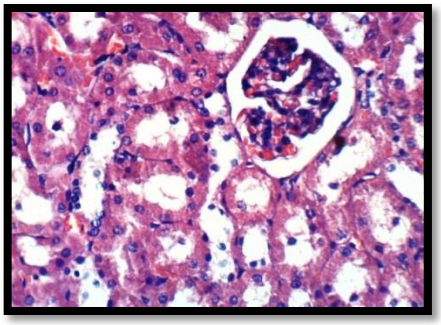

Photo (24): Kidney of rat from group 12 mixture of all flower powders at 4%showing no histopathological changes **(H & E X 400).**

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مقاومة التسمم الكبدي برابع كلوريد الكربونلذكورالفئران البيضاء باستخدام زهور النباتات

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المستخلص العربى :

تم إجراء الدراسة الحالية لمعرفة تأثيركل من زهور نبات(اليا سمين الهندى الابيض)و(زهور البابونج)و (زهور القرنفل)و(زهور العصفر) ومخلوطهم بنسبة ٢% و٤% على الخلل الفسيولوجى المحدث فى كبد الفئران المصابة والحادث بواسطة رابع كلوريد الكربون . تم إستخدام ٦٠ فأر ألبينو ذكور يتراوح أوزانهم ١٥٠±١٠جم وتم تقسيمهم إلى ١٢ مجموعات متساوية إحداهما كمجموعة ضابطة سالبة أما المجموعات الأخرى فتم إحداث تسمم بالكبد فيها بالحقن تحت الجلد برابع كلوريد الكربون المخلوط مع زيت البرافين ٥٠% بالحجم بنسبة ٢ ملجم / كجم من وزن الجسم مرتين أسبوعيا ولمدة أسبوعين . وأضيفت مساحيق الزهور ومخلوطهم بنسبة (٢ % ، ٤ %) لكل منها من الوجبة الأساسية على هيئة مسحوق ناعم وتم قياس نشاط إنزيمات الكبد (ALP, GPT,GOT) والبروتين الكلى والألبيومين والجلوبيولين ومعامل الألبيومين على الجلوبيولين والبيليروبين الكلى والبيليروبين المباشر والغير مباشر ودهون الدم (الكوليسترول الكلى ، والجليسريدات الثلاثية ، واللبيوبروتينات ، (HDL-c, LDL-c, VLDL-c) ووظائف الكلى (اليوريا والكرياتينين وحمض اليوريك). وكذلك إجراء الفحص الهستوباثولوجى لكل من الكبد والكلى . وقد أظهرت نتائج هذه الدراسة أن تناول مساحيق هذه الزهور ومخلوطهم نتج عنه تحسن فى وظائف الكبد والكلى ودهون الدم وكانت أفضل النتائج فى حالة التغذية غالبا على مخلوط مساحيق الزهور بنسبة ٤%.

الكلمات المفتاحية:زهور النباتات-الفئران - التحاليل الكيميائية الحيوية- التأثير الحافظ للكبد.