

## تأثير التغذية بأوراق نبات الحسيكة على الفئران التي تعاني من التسمم الكبدي الحاد

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## الملخص العربي

تهدف الدراسة الحالية إلى الكشف عن تأثير ثلاثة مستويات من مسحوق اوراق نبات الحسيكة بثلاثة تركيزات مختلفة هي ٢,٥, ٥, ١٠ % على الالتهاب الكبدي الحاد ، و قد تم تقسيم أربعون فأراً من سلالة الالبينو الذكور البالغة الى خمس مجموعات فرعية ، مجموعة كانت تتغذى على النظام الغذائي الاساسي واحتفظ بها كمجموعة ضابطة سالبة (-) وكانت مجموعات الفئران الاربعة الاخرى هي: مجموعة الالتهاب الكبدي الموجبة (+) ومجموعات ٢,٥, ٥, ١٠ % من مسحوق اوراق نبات الحسيكة.

في نهاية فترة التجربة البيولوجية تم تجويع الفئران طوال الليل ثم ذبحهم ، وتم جمع عينات الدم من الشريان الأورطي لتقدير دهون الدم ، وظائف الكبد الى جانب ذلك ، تم تسجيل القياسات التغذوية والبيولوجية وأيضاً الدراسات الهستوباثولوجية للكبد. أظهرت النتائج التي تم الحصول عليها أن حقن الفئران برابع كلوريد الكربون أدى إلى زيادة كبيرة في سمية الكبد ، وزيادة في (الدهون الثلاثية ، البروتينات الدهنية منخفضة الكثافة ، إنزيم اسبرتات ترانس امينيز ، الانين ترانس امينيز) وانخفاض وزن الجسم ، كمية الماخوذ من الطعام ، والبروتينات الدهنية المرتفعة الكثافة).

تغذية الفئران على نظام غذائي أساسي يحتوي على مستويات مختلفة من مسحوق اوراق نبات الحسيكة أدى الى تحسين جميع النتائج ، حيث انخفضت نسبة الدهون الثلاثية ، والكوليسترول البروتين الدهني منخفض الكثافة ، وإنزيمات الكبد ، في حين كان هناك زيادة في نسبة كولستيرول البروتين الدهني عالي الكثافة ، ومن الماخوذ من الطعام خاصة عند استخدام نسبة عالية من مسحوق اوراق نبات الحسيكة (١٠%) . وتوصى الدراسة بتدعيم المخبوزات والمنتجات الغذائية بمسحوق اوراق نبات الحسيكة وذلك لما أظهره من نتائج ايجابية في تحسين وظائف الكبد وكذلك صورة الدهون في الدم وبعض القياسات البيوكيميائية الأخرى.

**الكلمات المفتاحية:** نبات الحسيكة - إنزيم اسبرتات امين ترانسفيريز - إنزيم ألانين أمين ترانسفيريز - الجليسريدات الثلاثية -كوليستيرول الليبوبروتينات المنخفضة الكثافة - دهون الدم - الكبد - الفئران.

## Effect of Dietary *Bidens pilosa* L. leaves on Rats Suffering from Acute Liver toxicity

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### Abstract

The study aimed to reveal the effect of three levels of *Bidens pilosa* L. (Asteraceae) leaves powder 2.5, 5 and 10 % on acute liver hepatotoxicity. Forty adult albino male rats Sprague Dawley strain were classified into five groups. One was fed on basal diet and kept as control (-ve) group. The other four hepatic rat groups were control group (+ve), 2.5, 5 and 10% BPP groups.

At the end of the experimental period rats were fasted overnight and sacrificed, blood samples were collected from the aorta to determine lipids profiles and liver functions. Also, nutritional and biological parameters were recorded as well as histopathological studies for liver. The obtained results revealed that, injecting rats by CCL<sub>4</sub> led to significant increase in acute liver toxicity, and increase in (triglycerides, LDL-c, ALT, AST and ALP).

Feeding rats on basal diet supplemented with different levels from *Bidens pilosa* L. powder improved all parameters, reduced serum total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDL-c), and liver enzymes, while there was increase in serum high density lipoprotein cholesterol (HDL-c), and food intake especially when the high level 10% BPP is used. From the obtained results it can be concluded that, supplementation of bakery product with *Bidens pilosa* L. leaves powder exerts a positive impact on the liver functions, lipid profile and other biochemical parameters.

**Keywords:** *Bidens pilosa*, AST, ALT, TG, LDL-c, Lipid profile, Liver, Rats.

## Introduction

Medicinal plants have acquired increasing significance over the last few years. Their use and conservation are cross-sectoral concerns that embrace not only health-care but also nature conservation, biodiversity, economic assistance, trade and legal aspects (e.g., intellectual property). Even today, the majority of the world's population is dependent upon traditional medicine and the use of plants and plant extracts (*Abdel-Azim et al ., 2011*).Egypt's exports of medicinal plants that are classified under generic HS Code 1211 represented 53.4% of the total volume and 33.6% of the total reported value (*Abdel-Azim et al ., 2011*) .

Studies of *Bidens pilosa* plant extracts have shown it has anti-hyperglycemic (*Alarcon et al., 2002*), antihypertensive (*Dimo et al., 2002*), antiulcerogenic (*Alvarz et al., 1999*), hepatoprotective (*Yuan et al., 2008*), antipyretic (*Parimalakrishnan et al., 2006*), immunosuppressive and anti-inflammatory (*Horiuchi and Seyama, 2008*), anti-leukemic(*Chang et al., 2001*), anti-malarial (*Brandao et al., 1997*), anti-bacterial (*Rabe et al., 1997*), anti-oxidant (*Deba et al., 2008*) and antitumor effects (*Kviecinski et al., 2008*). These proven biological activities have led countries like Brazil to include *Bidens pilosa* in the official list of medicinal plants with potential for development of herbal use by the public health system.

Among the classes of compounds reported polyacetylenes and flavonoids, typical metabolite classes in the *Bidens* genus, predominate (*Christensen and lam, 1991*). A number of earlier studies also have reported the isolation of sterols (*Chang et al., 2000*), terpenoids (*Grombone et al., 2005*), phenylpropanoids (*Deba et al 2007*) and hydrocarbons (*Chang et al., 2000*).

## Materials and methods

### Material

Fresh leaves of *B. pilosa* L. was collected from the fields at El-Blakos Village, Kom Hamada City, El-Beheira governorate. Leaves was identified by Flora & Phytotaxonomy Researchers Department, belonging to Horticultural Research Institute, Agricultural Research Center.

Kits used for the quantitative determination of the different parameters were purchased from Biodiagnostic Co., Dokki, Giza, Egypt. 40 male Albino rats of Sprague Dawley strain weighing about (170±10g) obtained from Research Institute of Ophthalmology, Medical Analysis Department, Giza, Egypt. The animals were kept under observation for 1 week before experiment and fed on standard diet according to (*Reeves et al., 1993*), and water ad libitum.

### Methods:

#### Preparation of bidens pilosa leaves Powder:

Bidens pilosa leaves were washed with running tap water and dried. The dried plant was ground into fine powder.

#### Chemical composition of bidens pilosa leaves:

Bidens pilosa was chemically analyzed to determine its protein, fat, carbohydrate, fiber, ash and moisture content according to *A.O.A.C. (2005)*.

#### Biological assay:

40 male albino rats Sprague Dawley strain weighing (170±10g) were housed in well aerated cages under hygienic condition and fed on basal diet for one week for adaptation. The basal diet consists of casein 12.5 %, Corn oil 10%, choline chloride 0.25 %, vitamin mixture 1 % (*Campbell., 1963*), salt mixture 4% (*Hegested., 1941*), cellulose 5 %, and the remainder is corn starch (*Langley-Evans et al., 1996*).

Animals (40 rats) were equally divided into five groups (n=8).as follows: Group 1(CN) animals were fed on basal diet for 8 consecutive weeks and kept as control negative animals. After two weeks of the beginning of the experiment animals in the other four groups were injected interperitoneal (i.p) with CCL<sub>4</sub> (1 mL/kg b.w.,1:1 v/v mixture of CCL<sub>4</sub> and liquid paraffin) every 72 h for 14 days according to **Karthikeyan and Deepa (2010)**. Thereafter, in the subsequent 6 weeks these acutely diseased animals were allotted into; G2 (CP) animals were continued on the basal diet until the conclusion of the experiment, G3 (BPP2.5%) animals were given the basal diet plus 2.5% bidens pilosa L. leaves powder, G4 (BPP5%) animals were given the basal diet plus 5% bidens pilosa L. leaves powder,G5 (BPP10%) animals were given the basal diet plus 10% bidens pilosa L. leaves powder. Animals were handled and treated according to the University of Helwan guideline of ethics of experimental animals care and use.

At the end of the experimental period (4 weeks), rats were fasted overnight, then anaesthetized & incised longitudinally and blood samples were collected from the aorta. The blood samples were centrifuged and serum was separated to estimate some biochemical parameters, i.e. serum cholesterol (*Allain et al., 1974*), TG (*Fossati, and Prencipl., 1982*), HDL-c (*Lopes-Virella et al., 1977*), LDL-c (*Friedewald et al., 1972*), AST and ALT (*Ritman and Frankl., 1957*)

#### **Statistical Analysis:**

The obtained results was presented as mean  $\pm$ SD. Data was subjected to one way analysis of variance (ANOVA) followed by appropriate post hoc test using the SPSS statistic computer program. The differences between mean values was considered significant at  $P < 0.05$ .

## Results and discussions

### Chemical composition of bidens pilosa leaves powder (g/100 ):

Data in table (1) showed the chemical analysis of bidens pilosa, protein (29.10%), fat (1.48%), crude fiber (8.08%), carbohydrates (31.54%), ash (18.4%) and moisture (11.4%).

### Effect of Bidens pilosa leaves powdered on Feed Intake (FI), Body Weight Gain (BWG) % and Feed Efficiency Ratio (FER) of hepatotoxic rats:

As shown in Table (2) final body weight increased in control negative rats and the CCL<sub>4</sub> administration reduced this increase. On the other hand, giving bidens pilosa powder significantly reduced this increase of the weight. Administration of powdered bidens pilosa caused abstaining of rats feed intake, which consequently reduced body growth rate.

Also, increasing the percentage of supplementation above 10% of powdered bidens pilosa tended to burden the animal appetite for feed consumption. Feed efficiency ratio which reflects the feed/gain ratio was reduced by CCL<sub>4</sub> and bidens pilosa powder consumption. The magnitude of decrease was augmented by combining the CCL<sub>4</sub> with BPP. On the other hand rats given BPP show variations in BWG% and FER than control. Indeed, the body weight is a reflection of the health state and the body metabolism (**Bhatia and Khera, 2013**).

### **Effect of *Bidens pilosa* leaves powder on serum liver enzymes aspartate aminotransferase (AST), Alanine aminotransferase (ALT), alkaline phosphatase (ALP), and Total Bilirubin on hepatotoxic rats.**

Data listed in table (3) shows the effect of the liver function enzymes, aspartate aminotransferase (AST), Alanine aminotransferase (ALT), alkaline phosphatase (ALP), and Total Bilirubin of hepatotoxicated rats affected by feeding on diets supplemented with different levels of BPP. It is clear from table (3) there were significant  $p < 0.05$  increase for AST, ALT, ALP and total bilirubin enzymes in the serum of positive control group which recorded ( $141.7 \pm 12.4$ ,  $144.5 \pm 14.0$ ,  $207 \pm 16.5$ ,  $1.66 \pm 0.13$  U/L., respectively) as compared to negative control group which were ( $100.0 \pm 9.7$ ,  $38.5 \pm 2.5$ ,  $113.4 \pm 9.8$ ,  $1.0 \pm 0.08$  U/L., respectively).

All treated groups with different levels of BPP 2.5, 5 and 10% had significant  $p < 0.05$  decrease in serum levels of AST activities ( $134.7 \pm 11.5$ ,  $118.4 \pm 10.8$ ,  $103.0 \pm 9.7$  U/L.) and significant decrease in serum levels of ALT activities in different levels of BPP leaves powder ( $129.6 \pm 11.8$ ,  $109.7 \pm 9.9$ ,  $101.2 \pm 9.8$  U/L.) and significant decrease in serum levels of ALP activities in different levels of BPP leaves powder ( $183.7 \pm 15.7$ ,  $145.0 \pm 12$ ,  $138.7 \pm 10.9$  U/L.) and significant decrease in serum levels of Total bilirubin in different levels of BPP leaves powder ( $1.3 \pm 0.01$ ,  $1.28 \pm 0.09$ ,  $1.21 \pm 0.08$  mg%) when compared with the positive control group. Treated group with (10%) of BPP leaves powder showed the highest decrease of ALT, AST, ALP and Total Bilirubin levels in serum which close to negative control group as show in table (3). The hepatoprotective activity of the *Bidens pilosa* extracts was probably due to their constituents (phenolic acids and flavonoids). Several previous studies have reported



hepatoprotective potential of phenolic acids present in plants, such as chlorogenic and ferulic acids (**Rasha et al., 2016**).

The present study showed that CCl<sub>4</sub> challenge caused hepatocellular damage, which was clearly indicated by the marked elevation of serum enzyme (AST, ALT, and ALP) activities and reduction in the serum total protein, albumin, and liver glutathione content. ALT, AST, and ALP are considered the most sensitive markers for the diagnosis of hepatic injury, since they are located in cytoplasm, and deficiency of these enzymes occurs rapidly after cellular damage (**Ramaiah., 2007**).

#### **Effect of *Bidens pilosa* leaves powder on malondialdehyde, glutathione peroxidase and superoxide dismutase on hepatotoxic rats.**

The effects of diets containing *Bidens pilosa L.* in treatment dose of 2.5, 5 and 10% on malondialdehyde (MDA), glutathione peroxidase (GSH) and superoxide dismutase (SOD) of male rats injected with CCL<sub>4</sub> to induced liver hepatitis were reported in table (4).

Oxidantive stress as measured with malonaldialdhyde (MDA) increase significantly in the positive control group which was 291.5± 27.6 n mol/ml, respectively, compared to negative group which was 165.8± 15.4 mol/ml, Table (4).

Feeding *Bidens pilosa L.* significantly decrease malodialdehyde (MDA) in the treatment groups (244.3 ± 22.9, 218.7 ± 20.0, 205.0 ± 18.8) n mol/ml, respectively compared to positive treatment control group 291.5± 27.6 n mol/ml.

The best result in malondaldehyde (MDA) in treatment groups , is recorded in group 5 in rats fed on supplemented diet with 10% *Bidens pilosa L.*, followed by the other groups.

Antioxidant as measured by glutathione peroxidase was decreased significantly in the positive control group which was  $27.3 \pm 2.5$  mg/dl, respectively as compared with the negative control group  $47.5 \pm 4.0$  mg/dl, table (4).

Feeding *Bidens pilosa L.* significantly increase glutathione peroxidase in the treatment groups ( $32.1 \pm 3.0$ ,  $35.0 \pm 2.9$ ,  $40.5 \pm 3.6$ ) mg/dl, respectively compared to positive treatment control group  $27.3 \pm 2.5$  mg/dl.

The best result in glutathione peroxidase (GSH) in treatment groups , is recorded in group 5 in rats fed on supplemented diet with 10% *Bidens pilosa L.*, followed by the other groups.

Oxidant as measured by superoxide dismutase (SOD) was decreased significantly in the positive control group which was  $18.0 \pm 1.1$  mg/dl respectively as compared with negative control group  $33.8 \pm 3.2$  mg/dl, table (4).

Feeding *Bidens pilosa L.* significantly increase superoxide dismutase (SOD) in the treatment groups ( $23.2 \pm 2.0$ ,  $24.8 \pm 2.2$ ,  $26.9 \pm 2.4$ ) mg/dl, respectively as compared to positive treatment control group  $18.0 \pm 1.1$  mg/dl.

The best result in superoxide dismutase (SOD) in treatment groups , is recorded in group 5 in rats fed on supplemented diet with 10% *Bidens pilosa L.*, followed by the other groups. *B. pilosa* is claimed to treat more than 40 disorders, and 201 compounds have been identified from this plant. The medicinal utility of *B. pilosa* and its modes of action in relation to its known phytochemicals were discussed

herein. Polyynes, flavonoids, phenylpropanoids, fatty acids, and phenolics are the primary bioactive compounds of *B. pilosa*, and they have been reported to be effective in the treatment of tumors, inflammation/immune modulation, diabetes, viruses, microbes, protozoans, gastrointestinal diseases, hypertension, and cardiovascular diseases. Caution should be exercised in the therapeutic use of *B. pilosa* for hypoglycemia, hypotension, bleeding, and allergy (Arlene., 2013). Our result agree with (Li-Ping et al., 2008) who reported that hepatic MDA content was significantly increased in the acute liver injury of mice; SOD and GSH-Px activities in liver homogenates were significantly decreased in the CCl<sub>4</sub>-treated mice. These liver parameters were considerably ameliorated in mice pretreated with total flavonoids of *Bidens pilosa* L. 50 and 100 mg/kg. Moreover the MDA content was significantly reduced and SOD and GSH-Px activities

#### **Effect of *Bidens pilosa* leaves powder on total protein and albumin on hepatotoxic rats.**

The effects of diets containing *Bidens pilosa* L. in treatment dose of 2.5, 5 and 10 % on serum total protein and albumin levels of male rats injected with CCL<sub>4</sub> to induce liver hepatitis were reported in Table (5).

Results cleared that was a significant decrease in serum levels of total protein and albumin in positive control group ( $22.7 \pm 2.0$  and  $9.6 \pm 0.7$ mg /dl, respectively) as compared to negative control group ( $45.5 \pm 3.9$  and  $20.15 \pm 1.5$  mg /dl, respectively).

As regard to serum levels of total protein; all treated groups recorded a significant increases as compared to positive group ,the best result recorded (10%) of bidens pilosa leaves powder group ( $39.1 \pm 3.4$  mg/dl) as shown in table (5). Furthermore all treated groups showed a

significant increase in serum albumin as compared to positive control group. The best result recorded by the group treated with (10%) of bidens pilosa leaves powder ( $16.3 \pm 1.4$  mg/dl) as shown in table (5). From these results, it can be suggested that the Bidens pilosa extracts exerted hepatoprotective effect probably by stabilizing the cell membrane of hepatocytes, which prevented the loss of functional integrity and cellular leakage from the cell membrane (Najmi et al., 2005). These results are consistent with a previous study, which reported that CCL4 induced inhibition of protein synthesis and secretion (Wong et al., 2007).

#### **Effect of Bidens pilosa leaves powder on total cholesterol (TC) and triglycerides (TG) on hepatotoxic rats.**

Data listed on table (6) show the total cholesterol and triglycerides of hepatointoxicated rats as affected of feeding on supplemented diets with different levels of bidens pilosa leaves.

Results cleared that was a significant increase in serum levels of total cholesterol and triglycerides in positive control group ( $141.7 \pm 12.4$  and  $144.5 \pm 14.0$ mg /dl, respectively) as compared to negative control group ( $91.8 \pm 8.0$  and  $83.3 \pm 7.6$  mg /dl, respectively).

As regard to serum levels of total cholesterol; all treated groups recorded a significant decreases as compared to positive group ,the best result recorded (10%) of bidens pilosa leaves powder group (  $103.0 \pm 9.7$  mg/ml) as shown in table (6). Moreover all treated groups showed a significant decrease in serum triglycerides as compared to positive control group. The best result recorded by the group treated with (10%)

of bidens pilosa leaves powder ( $101.2 \pm 9.8$  mg/ml) as shown in table (6). In this respect **Capectka et al., (2005)** who found that essential oils of bidenes pilosa have good potential for antioxidant activity and can be used in lipid-containing foods. It is a rich source of antioxidants, in particular from the group of phenolic compounds.

### **Effect of Bidens pilosa leaves powder on Lipoprotein fractions (HDL, LDL) on hepatotoxic rats.**

Data presented in table (7) showed that serum levels of lipoprotein fraction (HDL, LDL) of hepatointoxicanted rats as affected of feeding on supplemented diets with different levels of bidens pilosa leaves. It could be observed from table (5) that due to hepatotoxicity serum lipoprotein fraction showed significant decrease in HDL but significant increase in LDL in positive control group ( $28.0 \pm 2.3$  and  $84.8 \pm 7.8$  mg/ml) as compared to negative control group ( $45.7 \pm 4.0$  and  $29.5 \pm 2.4$ ) respectively.

Data in table (7) showed that serum levels of HDL had significant increase in all treated groups as compared to positive control group. Treated group with (10%) of Bidens pilosa L. leaves powder recorded the best result for HDL level ( $36.5 \pm 3.3$ ) as compared to positive group ( $28.0 \pm 2.3$ ) as shown in table (7). On the other hand the serum levels of LDL had significant decrease for all treated groups as compared to positive control group. Treated group with (10%) of Bidens pilosa L. leaves powder recorded the best result for LDL level ( $46.2 \pm 4.4$ ) as compared to positive control group ( $84.8 \pm 7.8$ ) as shown in table (7).

**Table (1): Chemical composition of bidens pilosa leaves powder (g/100 )**

Components	Value %
Moisture	11.4
Protein	29.10
Fat	1.48
Ash	18.4
Crude fiber	8.08
Total Carbohydrate	31.54

**Table (2): Effect of Bidens pilosa leaves powder on on Feed Intake (FI), Body Weight Gain (BWG) % and Feed Efficiency Ratio (FER) of hepatotoxic rats**

Parameters Groups	FI (g/d)	BWG% Mean±SE	FER Mean±SE
CN	17.9	55.3 ±1.61	4.3±0.02
CP	12.5	*** 33.9±3.37	*** 4.6± 0.01
BPP 2.5%	13.1	** 33.2±3.85	*** 4.2 ±0.04
BPP 5%	14.2	** 32.2 ±2.02	** 3.8 ±0.01
BPP 10%	14.8	** 31.7 ±2.41	** 3.6± 0.05

CN: Control negative, CP: Control Positive, BPP2.5%: Bidens pilosa powder 2.5%,

BPP5%: Bidens pilosa powder 5%, BPP10%: Bidens pilosa powder 10%

Each value represents the mean of 8 rats ± SE.

Significant different from the corresponding control group at P<0.05\*, P<0.01\*\* and P<0.001\*\*\*.

**Tabl (3): Effect of Bidens pilosa leaves powder on serum liver enzymes AST, ALT, ALP and total bilirubin on hepatotoxic rats.**

Parameters Groups	AST U/I	ALT U/I	ALP U/I	T. Billirubin mg/ml
<b>CN</b>	<b>100.0 ± 9.7</b>	<b>38.5 ± 2.5</b>	<b>113.4 ± 9.8</b>	<b>1.0 ± 0.08</b>
<b>CP</b>	*** <b>141.7 ± 12.4</b>	*** <b>144.5 ± 14.0</b>	*** <b>207 ± 16.5</b>	*** <b>1.66 ± 0.13</b>
<b>BPP 2.5%</b>	*** <b>134.7 ± 11.5</b>	*** <b>129.6 ± 11.8</b>	*** <b>183.6 ± 15.7</b>	** <b>1.3 ± 0.1</b>
<b>BPP 5%</b>	* <b>118.4 ± 10.8</b>	** <b>109.7 ± 9.9</b>	* <b>145.0 ± 12</b>	* <b>1.28 ± 0.09</b>
<b>BPP 10%</b>	<b>103.0 ± 9.7</b>	<b>101.2 ± 9.8</b>	<b>138.7 ± 10.9</b>	<b>1.21 ± 0.08</b>

CN: Control negative, CP: Control Positive, BPP2.5%: Bidens pilosa powder 2.5%,

BPP5%: Bidens pilosa powder 5%, BPP10%: Bidens pilosa powder 10%

Each value represents the mean of 8 rats ± SE.

Significant different from the corresponding control group at P<0.05\*, P<0.01\*\* and P<0.001\*\*\*.

**Table(4): Effect of Bidens pilosa leaves powder on malondialdehyde (MDA), glutathione peroxidase (GSH) and superoxide dismutase (SOD) on hepatotoxic rats.**

<b>Parameters Groups</b>	<b>MDA</b> (nmol/g protein tissue)	<b>GSH</b> (u/mg protein tissue)	<b>SOD</b> (u/mg protein tissue)
<b>CN</b>	<b>165.8 ± 15.4</b>	<b>47.5 ± 4.0</b>	<b>33.8 ± 3.2</b>
<b>CP</b>	*** <b>291.5 ± 27.6</b>	*** <b>27.3 ± 2.5</b>	*** <b>18.0 ± 1.1</b>
<b>BPP 2.5%</b>	*** <b>244.3 ± 22.9</b>	** <b>32.1 ± 3.0</b>	** <b>23.2 ± 2.0</b>
<b>BPP 5%</b>	** <b>218.7 ± 20.0</b>	* <b>35.0 ± 2.9</b>	* <b>24.8 ± 2.2</b>
<b>BPP 10%</b>	<b>205.0 ± 18.8</b>	<b>40.5 ± 3.6</b>	<b>26.9 ± 2.4</b>

**CN:** Control negative, **CP:** Control Positive, **BPP2.5%:** Bidens pilosa powder 2.5%,

**BPP5%:** Bidens pilosa powder 5%, **BPP10%:** Bidens pilosa powder 10%

Each value represents the mean of 8 rats ± SE.

Significant different from the corresponding control group at P<0.05\*, P<0.01\*\* and P<0.001\*\*\*.



**Table (5): Effect of Bidens pilosa leaves powder on total protein and albumin on hepatotoxic rats.**

Parameters Groups	T. Protein mg/dl	Albumin mg/dl
<b>CN</b>	<b>45.5 ± 3.9</b>	<b>20.15 ± 1.5</b>
<b>CP</b>	*** <b>22.7 ± 2.0</b>	*** <b>9.6 ± 0.77</b>
<b>BPP 2.5%</b>	*** <b>29.2 ± 2.3</b>	** <b>13.7 ± 1.0</b>
<b>BPP 5%</b>	* <b>33.1 ± 3.0</b>	* <b>14.6 ± 1.1</b>
<b>BPP 10%</b>	<b>39.1 ± 3.4</b>	<b>16.3 ± 1.4</b>

**CN:** Control negative, **CP:** Control Positive, **BPP2.5%:** Bidens pilosa powder 2.5%,

**BPP5%:** Bidens pilosa powder 5%, **BPP10%:** Bidens pilosa powder 10%

Each value represents the mean of 8 rats ± SE.

Significant different from the corresponding control group at  $P < 0.05^*$ ,  $P < 0.01^{**}$  and  $P < 0.001^{***}$ .

**Table (6): Effect of Bidens pilosa leaves powder on total cholesterol (TC) and triglycerides (TG) on hepatotoxic rats.**

Parameters Groups	TC (mg/ml)	TG (mg/ml)
<b>CN</b>	<b>91.8±8.0</b>	<b>83.3 ±7.6</b>
<b>CP</b>	*** <b>141.7±12.4</b>	*** <b>144.5 ±14.0</b>
<b>BPP 2.5%</b>	*** <b>134.7 ± 11.5</b>	*** <b>129.6 ± 11.8</b>
<b>BPP 5%</b>	* <b>118.4 ±10.8</b>	** <b>109.7 ±9.9</b>
<b>BPP 10%</b>	<b>103.0 ±9.7</b>	<b>101.2 ± 9.8</b>

**CN:** Control negative, **CP:** Control Positive, **BPP2.5%:** Bidens pilosa powder 2.5%,

**BPP5%:** Bidens pilosa powder 5%, **BPP10%:** Bidens pilosa powder 10%

Each value represents the mean of 8 rats ± SE.

Significant different from the corresponding control group at  $P<0.05^*$ ,  $P<0.01^{**}$  and  $P<0.001^{***}$ .

**Table (7): Effect of Bidens pilosa leaves powder on Lipoprotein fractions (HDL, LDL) on hepatotoxic rats.**

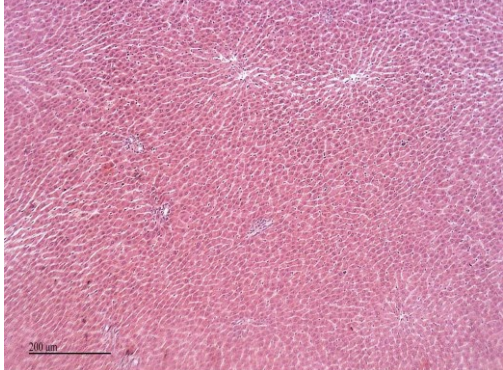
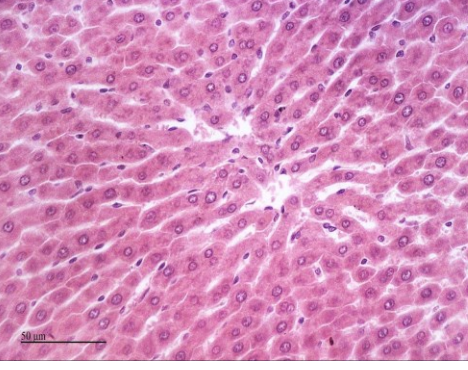
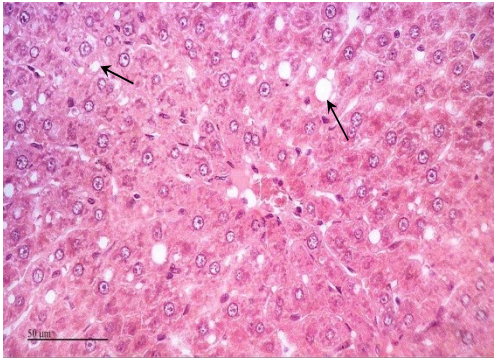
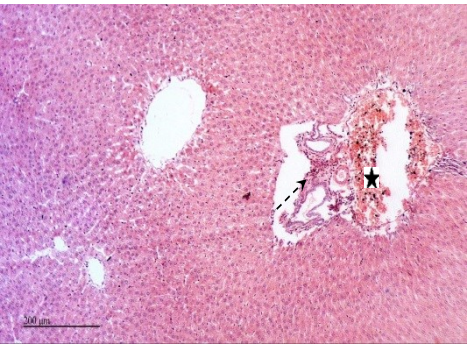
Parameters Groups	HDL (mg/ml)	LDL (mg/ml)
<b>CN</b>	<b>45.7 ± 4.0</b>	<b>29.5 ± 2.4</b>
<b>CP</b>	*** <b>28.0 ± 2.3</b>	*** <b>84.8 ± 7.8</b>
<b>BPP 2.5%</b>	** <b>30.9 ± 3.0</b>	*** <b>77.88 ± 7.0</b>
<b>BPP 5%</b>	* <b>33.0 ± 3.1</b>	*** <b>63.4 ± 5.8</b>
<b>BPP 10%</b>	<b>36.5 ± 3.3</b>	*** <b>46.2 ± 4.4</b>

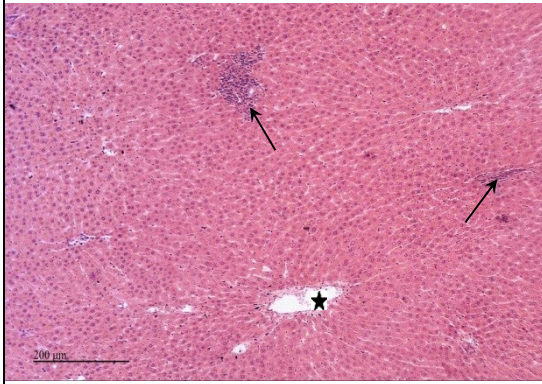
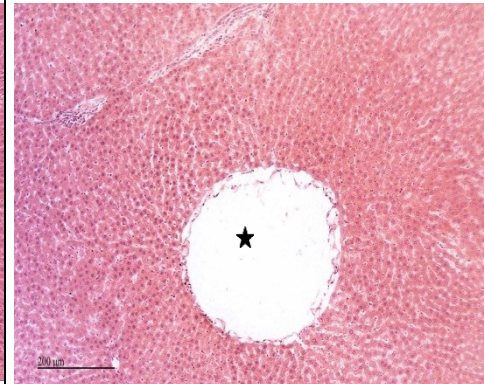
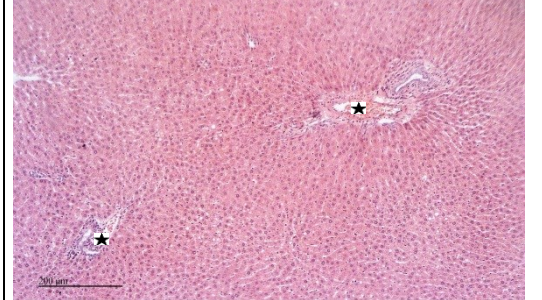
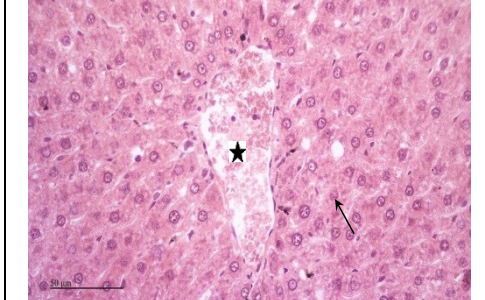
**CN:** Control negative, **CP:** Control Positive, **BPP2.5%:** Bidens pilosa powder 2.5%,

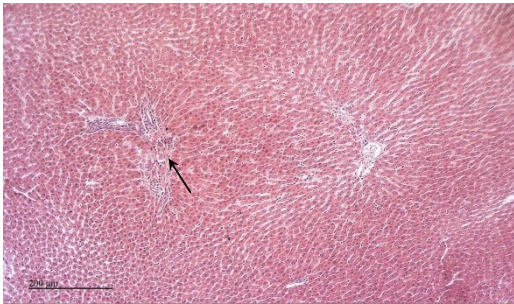
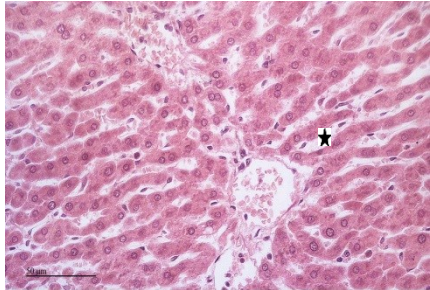
**BPP5%:** Bidens pilosa powder 5%, **BPP10%:** Bidens pilosa powder 10%

Each value represents the mean of 8 rats ± SE.

Significant different from the corresponding control group at  $P < 0.05^*$ ,  $P < 0.01^{**}$  and  $P < 0.001^{***}$ .

	
<p><b>Fig. (1):</b> revealed normal histological structure of hepatic parenchyma with apparent intact hepatocytes, central veins and portal areas.</p>	<p><b>Fig. (2):</b> revealed normal histological structure of hepatic parenchyma with apparent intact hepatocytes, central veins and portal areas</p>
	
<p><b>Fig (3)</b> showed focal areas of mild fatty degenerative changes of some hepatocytes (<b>arrows</b>),</p>	<p><b>Fig (4)</b> showed congested hepatic blood vessels accompanied with periportal focal aggregation of inflammatory cells (<b>dashed arrow</b>). Occasionally pericentral necrosis of hepatocytes were recorded in some samples (<b>red arrow</b>).</p>

	
<p><b>Fig. (5):</b> revealed moderate dilatation of hepatic central veins (<b>star</b>) with periportal inflammatory cells infiltration (<b>arrow</b>). Most of hepatocytes were apparently intact.</p>	<p><b>Fig. (6):</b> revealed moderate dilatation of hepatic central veins (<b>star</b>) with periportal inflammatory cells infiltration .</p>
	
<p><b>Fig. (7):</b> showed; few records of degenerative changes of hepatocytes (<b>arrow</b>). Mild congestion and dilation of hepatic blood vessels (<b>star</b>) with fewer inflammatory cells infiltration.</p>	<p><b>Fig.(8):</b> showed; few records of degenerative changes of hepatocytes (<b>arrow</b>). Mild congestion and dilation of hepatic blood vessels (<b>star</b>) with fewer inflammatory cells infiltration.</p>

	
<p><b>Fig. (9):</b> showed congested hepatic blood vessels in most of liver samples. Some samples also showed periportal inflammatory cells infiltration (<b>arrow</b>) as well as pericentral hepatic necrosis as well as degenerated hepatocytes (<b>red arrow</b>).</p>	<p><b>Fig. (10):</b> showed; moderate dilatation of hepatic sinusoids (<b>star</b>) as well as congested hepatic blood vessels in most of liver samples. Some samples also showed periportal inflammatory cells infiltration .</p>

### Conclusion:

From the obtained results it can be concluded that, supplementation of food bakery with *Bidens pilosa* L. leaves powder exerts a positive impact on the liver functions, lipid profile and other biochemical parameters. Further studies must be warranted to investigate different ingredients of *Bidens pilosa* L. on mammals wellbeing.

## References

- Abdel-Azim, N.S., Shams, K.A., Shahat, A.A., El-Missiry, M.M., Ismail, S.I. and Hammouda, F.M. (2011).** Egyptian herbal drug industry: challenges and future prospects. Research Journal of Medicinal plant, 5(2): 136-144.
- Alarcon F.J., Roman R., Flores, J.L. and Aquirre, F. (2002).** Investigation on the hypoglycemic effects of extracts of four Mexican medicinal plants in normal and alloxan-diabetic mice. Phytotherapy Research, 16:383-386.
- Allain, C. Z.; Poon-L. S. and Chan, C. S. (1974):** Enzymatic determination of total serum cholesterol. Clin. Chem.; 20:470-475.
- Alvarez, A., Pomar, F.S., Sevilla, M.A. and Montero. M.J.(1999).** Gastric antiseptory and antiulcer activities of an ethanolextract of *Bidens pilosa* L. var. *radiata* Schult. Bip. Journal of Ethnopharmacology, 67:333-340.
- Arlene P. Bartolome, Irene M. Villaseñor, and Wen-Chin Yang<sup>2,3</sup> (2013):** *Bidens pilosa* L. (Asteraceae): Botanical Properties, Traditional Uses, Phytochemistry, and Pharmacology. Review article, Volume 2013, Article ID 340215, 51 pages.
- A.O.A.C. (2005):** Official methods of analysis of the association of official analytical chemistry, 15<sup>th</sup> ed. Washington, D.C.
- Bhatia, A. and Khera, N. (2013):** Hypoglycaemic activity of orally administered *Woodfordia fruticosa* flower extract in alloxan-induced diabetic mice. Int J Life Sci Biolechnol Pharm Res., 2:2250-3137.
- Brandao, M.G., Krettli, A.U., Soares, L.S. Nery, C.G. and Marinuzzi, H.C. (1997).** Antimalarial activity of extracts and fractions from *Bidens pilosa* and other *Bidens pilosa* species (Asteraceae) correlated with the presence of acetylene and flavonoid compounds. J. Ethnopharmacol., 57: 131-138.

- Campbell, J. A. (1963):** Methodology of protein evaluation. RAG. Nutrition DOC.R. 10/Led 37. June Meeting, New York.
- Capecka E, Mareczek A, Leja M. (2005):** Antioxidant activity of fresh and dry herbs of some Lamiaceae species. Food Chem.;93:223–226.
- Chang, M.H., Wang,G.J., Kuo, Y.H. and Lee, C.K.(2000).** The low polar constituents from *Bidens pilosa* L.var .minor (Blume) Sherff. J.Chin.Chem. Soc., 47:1131-1136.
- Chang, J.S., Chiang, L.C., Chen, C. C.; Liu, L. T.; Wang, K. C. and Lin, C. C. (2001).** Antileukemic activity of *Bidens pilosa* L. var. minor (Blume) Sherff and *Houttuynia cordata* Thunb. Am. J. Chin. Med., 29(2): 303-312.
- Christopersen, B.O. (1991).** Acetylenes and related compounds in Heliantheae. Phytochemistry, 30: 11-49.
- Deba, F., Xuan, Yuan, T.D., Yasuda, M. and Tawata, S. (2007).** Herbicidal and fungicidal activities and identification of potential phytotoxins from *Bidens pilosa* L. var. radiata Scherff. Weed Biol. Manag., 7: 77-83.
- Deba, F., Xuan, Yuan, T.D., Yasuda, M. and Tawata, S. (2008).** Chemical composition and antioxidant, antibacterial and antifungal activities of the essential oils from *Bidens pilosa* Linn.var.radiata. Food control, 19: 346-352.
- Dimo, T., Rakotonirina, S.V., Tian, Z. (2007).** The roles of innate immune cells in liver injury and regeneration. Cell Mol Immunol., 4:241-252.
- Fossati, P. and Prencipl, L. (1982):** Enzymatic colorimetric determination of serum triglycerides. Clin. Chem., 28:2077.



**Friedewald, W. T.; Leve, R. I. and Fredrichson, D. S. (1972):** Estimation of concentration of low-density lipoproteins separated by three different. Clin. Chem.; 18:499-502.

**Grombone-Guaratini, M.T.,Silva-Brandao, K.I, Solferini, V.N., Semir, J. and Trigo, J.R. (2005).** Sesquiterpene and polyacetylene profile of *Bidens pilosa* complex (Asteraceae: Heliantheae)from southeast of Brazil. Biochem. Syst.Ecol., 33: 479-486.

**Hegseted, D. M.; Mills, R. C.; Elvehjem, C. A. and Hart, E. B. (1941):** Choline in the nutrition of chicks. J. Biol. Chem.; 138: 459-470.

**Horiuchi, M. and Seyama, Y.(2008).**Improvement of the anti-inflammatory and anti-allergic activity of *Bidens pilosa* L. var. radiata Scherff treated with enzyme (cellulosease). J.Health Sci., 54:294-301.

**Karthikeyan, M. and Deepa, K. (2010):** Hepatoprotective effect of *Premna corymbosa* (Burm.f.) Rottl. & Willd. Leaves extract on CCL<sub>4</sub> induced hepatic damage in Wistar albino rats. Asian Pac. J. Trop. Med., 3(1): 17-20.

**Kviecinski, M.R., Felipe, K.B., Schoenfelder, T., Wiese, L.P., Rossi, M.H., Goncalz, E., Felicio, J.D., Filho, D.W. and Pedrosa, R.C.(2008).** Study of the antitumor potential of *Bidens pilosa* (Asteraceae) used in Brzillian folk medicine. J. Ethnophar., 117: 69-75.

**Langely-Evans, S. C.; Gardner, D. S. and Jackson, A.A. (1996).** Association of disproportionate growth of fetal rats in late gestation with raised systolic blood pressure in later life. J. Reprod. Fertile., 106: 307-312.

**Li-Ping Y, Fei-Hu C, Lu L, Peng-Fei D, Hu B, Ming-Mei Z, Li-Juan X (2008):**

Protective effects of total flavonoids of *Bidens pilosa* L. (TFB) on animal liver injury and liver fibrosis. *Journal of Ethnopharmacology* 116 (2008) 539–546.

**Lopes-virella, M. F.; Stone, S.; Ellis, S. and Collwell, J. (1977):** Cholesterol determination in high density lipoproteins separated by three different methods. *Clin. Chem.*; 23 (5) 882.

**Najmi AK, Pillai KK, Pal SN, Aqil M. (2005):** Free radical scavenging and hepatoprotective activity of jigrine against galactosamine induced hepatopathy in rats. *J Ethnopharmacol.* 2005; 97: 521–525.

**Parimalakrishnan, S., Akalanka, D., Anton, S., Gana, D. A., manavalan, R. and Sridhar, N. (2006):** Studies of anticancer and antipyretic activity of *Bidens pilosa* whole plant. *Afr. Health sci.*, 6: 27-30.

**Rabe, T., Van, and Staden, V. (1997).** Antibacterial activity of south African plants used for medicinal purposes. *J. Ethnopharmacol.*, 56: 81-87.

**Ramaiah SK. (2007):** A toxicologist guide to the diagnostic interpretation of hepatic biochemical parameters. *Food Chem Toxicol.* 45: 1551–1557.

**Rasha H. , Waleed M. , Abdelaaty S, Walid A. and Elzahraa A.(2016):** In vitro and in vivo hepatoprotective activity of extracts of aerial parts of *Bidens pilosa* L (Asteraceae). *Tropical Journal of Pharmaceutical Research* November 2016; 15 (11): 2371-2381

**Reeves, P.G., Nielsen, F.H. and Fahey, G.C. (1993):** AIN-93 purified diets for laboratory rodents: Final report of the American Institute of

Nutrition and hoc writing committee on the reformulation of the AIN-76A rodent diet. J. Nutr.,123 (11):1939-1951.

**Reitman, S. and Frankel, S. (1957):** Acolorimetric methods for the determination of serum glutamic oxaloacetic and glutamic pyruvic transaminase. Am.J. Clin. Path.

**Wong MC, Portmann B, Sherwood R, Niemela O, Koivisto H, Parkkila S, Trick K, L'abbe MR, Wilson J, Dash PR, Srirajaskanthan R, Preedy VR, Wiseman H. (2007):** The cytoprotective effect of alpha-tocopherol and daidzein against D-galactosamine-induced oxidative damage in the rat liver. Metabolism. 2007; 56: 865-875

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