3. Results

3.1 Evaluation of possible protective effects of the leaves extract of FR Linn on Cisplatin-induced Hepatotoxicity, Nephrotoxicity and Neurotoxicity in mice (PART A)

3.1.1 Study of the phytochemical profiles of the leaves extract of FR Linn

3.1.1.1 The phytochemical screening assay

The phytochemical screening of different leaves extracts of FR Linn, has shown in Table 3-1. Primary screening of different leaf extracts of FR demonstrated the presence of Glycosides, Carbohydrates, Tannins, Flavonoids, Steroids, Triterpenoids in all extracts.

Table 3-1: Phytochemical screening assay on leaf extracts of FR Linn

<table>
<thead>
<tr>
<th>Plant constituents</th>
<th>FRA</th>
<th>FRE</th>
<th>FRM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saponins</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Glycosides</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Tannins</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Steroids</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Triterpenoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
3.1.1.2 Study the total phenolics, flavonoids, and tanins contents

The total phenolic content of FR Linn, using three solvent systems: aqueous, ethanol and methanol are presented in table 3-2. Among the different extracts, methanol extract of FR leaf offered the highest phenolic (131.9 mg GAE/g plant extract), flavonoids (73.3 mg RE/g plant extract) and tanins (27.5 mg GAE/g plant extract) content.

Table 3-2: Total phenolic, flavonoids, and tanin contents in the different leaf extracts of FR Linn.

<table>
<thead>
<tr>
<th>Extract</th>
<th>Total phenolic Content  (mg GAE/g plant extract)</th>
<th>Total flavonoids content  (mg RE/g plant extract)</th>
<th>Total tanin content  (mg GAE/g plant extract)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRA</td>
<td>69.3 ± 9.3 (^{a})</td>
<td>49.4 ± 6.6 (^{a})</td>
<td>10.6 ± 2.5 (^{a})</td>
</tr>
<tr>
<td>FRE</td>
<td>128.1 ± 13.1 (^{b})</td>
<td>68.5 ± 5.1 (^{b})</td>
<td>22.1 ± 4.3 (^{b})</td>
</tr>
<tr>
<td>FRM</td>
<td>131.9 ± 10.5 (^{b})</td>
<td>73.3 ± 4.4 (^{b})</td>
<td>27.5 ± 3.8 (^{b})</td>
</tr>
</tbody>
</table>

Each value in the table is represented as mean ± SD (n = 5). Values in the same column followed by a different letter are significantly different (P < 0.05).
3.1.1.3 Hydrogen peroxide scavenging capacity

The ability of the extracts to inhibition the hydrogen peroxide activity had presented in Table 3-3. Hydrogen peroxide inhibition activity of different leaf extracts of FR, have presented in Table 3-3. Hydrogen peroxide inhibition activity was observed to be more as the concentrated extract. As shown in table 3-3, higher concentration of the extracts offered the higher potential to scavenging activity in radicals of Hydrogen peroxide significantly (P < 0.05).

Table 3-3: Hydrogen peroxide scavenging capacity of aqueous, ethanolic and methanolic extracts of FR Linn leaf.

<table>
<thead>
<tr>
<th>Concentration (µg/ml)</th>
<th>FRA</th>
<th>FRE</th>
<th>FRM</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>13.2 ± 1.4</td>
<td>17.2 ± 2.8</td>
<td>25.2 ± 2.2</td>
</tr>
<tr>
<td>200</td>
<td>16.5 ± 2.3</td>
<td>20.7 ± 3.6</td>
<td>28.1 ± 3.8</td>
</tr>
<tr>
<td>300</td>
<td>19.8 ± 3.1</td>
<td>21.3 ± 1.4</td>
<td>33.3 ± 3.4</td>
</tr>
<tr>
<td>400</td>
<td>22.7 ± 5.6</td>
<td>29.5 ± 3.7</td>
<td>34.5 ± 4.2</td>
</tr>
<tr>
<td>500</td>
<td>23.3 ± 3.4</td>
<td>30.1 ± 4.1</td>
<td>39.8 ± 5.9</td>
</tr>
</tbody>
</table>

Each value in the table is represented as mean ± SD (n = 3). Values in the same column followed by a different letter are significantly different (P < 0.05).
3.1.1.4 The Reducing power assay

The Reducing power or anti-oxidative potential of the aqueous, ethanol and methanol extracts of FR Linn leaf, was estimated using potassium ferric cyanide reduction method (Figure 3-1). Higher reducing power is observed in more concentrated extract. The methanolic extracts of plants showed the higher reducing power.

**Figure 3-1:** Reducing power of aqueous, ethanolic and methanolic extracts of FR Linn leaf, at different concentrations.

Each value in the table is represented as mean ± SD (n = 3).
3.1.1.5 Study of the superoxide scavenging activity

The superoxide radical scavenging effect of fractions was compared with the same doses of ascorbic acid ranging from 0 to 50 μg/ml. The ranking order for superoxide scavenging activity, compared to ascorbic acid, was FRM > FRE > FRA (Figure 3-2); The higher percentage of superoxide radical scavenging activity was evident in FRM fractions (58.18±3.48 μg/ml) at 50 μg/ml significantly (P < 0.05).

![Graph showing superoxide scavenging capacity of aqueous, ethanolic and methanolic extracts of FR Linn leaf.](image)

**Figure 3-2:** Superoxide anion scavenging capacity of aqueous, ethanolic and methanolic extracts of FR Linn leaf.
Each value in the table is represented as mean ± SD (n = 3).
### 3.1.1.6 Study of the Hydroxyl radical scavenging activity

The hydroxyl radical scavenging activity of plant extracts was quantified by measuring the inhibition percentage of the 2-deoxyribose by the free radicals generated by the Fenton reaction. The hydroxyl radical scavenging activity of fractions can be ranked as FRM > FRE > FRA. All fractions showed dose dependent antioxidant activity (Figure 3-3). In the present investigation, the value of hydroxyl radical scavenging activity for the FRM was 44.51 ±3.4 μg/ml as the higher activity at 50 μg/ml significantly (P < 0.05).

![Figure 3-3](image)

**Figure 3-3:** Hydroxyl Radical scavenging capacity of aqueous, ethanolic and methanolic extracts of FR Linn leaf.
Each value in the table is represented as mean ± SD (n = 3).
3.1.2 The acute toxicity studies on the different leaf extracts of FR Linn in mice

3.1.2.1 Study the serum transaminases (ALT, AST) and ALP activity

Administration of the aqueous ethanol and methanolic extracts of Ficus religios, at the different doses, did not produce any significant (p < 0.05) changes in serum ALT, AST and ALP levels, compared to vehicle control group (Figures 3-4, 3-5 and 3-6).
**Figures 3-4, 3-5 and 3-6**: Effect of leaf extract of FR Linn on the serum levels of ALT, AST and ALP in normal mice.

Values are mean ± S.D, n = 6
3.1.2.2 Study the serum levels of BUN and Cr

As shown in figures 3-7 and 3-8, administration of the aqueous, ethanol and methanolic extracts of FR, at the different doses, did not produce any significant ($p < 0.05$) changes in serum levels of BUN and Cr, compared to vehicle control group (Figures 3-7 and 3-8).

**Figures 3-7 and 3-8:** Effect of leaf extract of FR Linn, on the serum levels of BUN and Cr in normal mice.

Values are mean ± S.D, n = 6
3.1.3 The possible protective effects of the leaves extract of FR Linn on Cisplatin-induced Neurotoxicity in mice

3.1.3.1 Study the transaminases (ALT, AST) and ALP activity of brain against Cisplatin induced toxicity in mice

Cisplatin administration in NCG, resulted in a significant decrease in the AST, ALT and ALP levels of brain (p < 0.05); respectively; compared to control group. Administration of the aqueous ethanol and methanolic extract of FR, increased the reduced level of brain transaminases (AST, ALT) and ALP, compared to normal control group (Figures 3-9,3-10 and 3-11).
**Figures 3-9,3-10 and 3-11:** The effect of FR Linn on AST, ALT and ALP concentration of brain in mice induced toxicity by Cisplatin.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG group (p< 0.05).
3.1.3.2 Effect of FR Linn leaf extract on the MDA level of brain against Cisplatin induced toxicity in mice

As showed in Figure 3-12, MDA level of brain was significantly increased \((P < 0.05)\) in the Cisplatin-treated animals compared to the normal group. Treatment of animals with methanol and ethanol extracts of FR significantly reduced the elevated levels of brain MDA at highest dosage. The extract treatment was able to lower the serum MDA to almost normal level significantly \((p < 0.05)\).

![Figure 3-12: Effect of FR Linn leaf extract on the MDA level of brain, against Cisplatin induced toxicity in mice. Values are mean ± S.D, n = 6. * Indicate significance compared to control group \((p< 0.05)\). ** Indicate significance compared to NCG \((p< 0.05)\).](image-url)
3.1.4 Effect of FR Linn leaf extract on the enzymatic antioxidant defense system of brain against Cisplatin toxicity in mice

3.1.4.1 Effect of FR Linn leaf extract on the GSH level of brain against Cisplatin induced toxicity in mice

As seen from Figure 3-13, GSH level of brain was lower in the NCG group compared with the control values. Treatment with methanolic and ethanolic extracts of FR elevated the activity of brain GSH in the mice induced with Cisplatin toxicity (p < 0.05).

**Figure 3-13:** Effect of FR Linn leaf extract on GSH level of brain against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
### 3.1.4.2 Effect of FR Linn leaf extract on the SOD level of brain against Cisplatin induced toxicity in mice

As shown in Figure 3-14, SOD level of brain was lower in the NCG group compared to the control values. Treatment of the methanolic extract of FR at the high dosage (1000 mg/kg BW) elevated the level of brain SOD significantly (p < 0.05) in the mice induced with Cisplatin toxicity.

![Figure 3-14: Effect of FR Linn leaf extract on SOD level of brain against Cisplatin induced toxicity in mice.](image)

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p < 0.05).

** Indicate significance compared to NCG (p < 0.05).
**Chapter 3: Results**

### 3.1.4.3 Effect of FR Linn leaf extract on the CAT level of brain against Cisplatin induced toxicity in mice

As seen from Figure 3-15, CAT level of brain, was lower in the NCG group compared with the control values.

Treatment of animals with the high concentration of the methanolic and ethanolic extracts of FR elevated the activity of brain CAT near to normal levels in Cisplatin induced mice significantly \((p < 0.05)\).

**Figure 3-15:** Effect of FR Linn leaf extract on CAT level of brain against Cisplatin induced toxicity in mice.

Values are mean ± S.D, \(n = 6\)

* Indicate significance compared to control group \((p < 0.05)\).

** Indicate significance compared to NCG \((p < 0.05)\).
3.1.4.4 Effect of FR Linn leaf extract on the GR level of brain against Cisplatin induced toxicity in mice

As reported in Figure 3-16, GR level of brain, was lower in the NCG group when compared to the normal values. However treatment with ethanol and methanol extracts of FR elevated the activity of brain GR compared to normal control group significantly (p < 0.05).

![Figure 3-16](image)

**Figure 3-16:** Effect of FR Linn leaf extract on GR level of brain against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.1.4.5 Effect of FR Linn leaf extract on the GST level of brain against Cisplatin induced toxicity in mice

As reported in Figure 3-17, GST level of brain, was lower in the NCG group compared with the control values. However, treatment with different extracts of FR increased the reduced level of GST activity of brain induced with Cisplatin toxicity (p < 0.05).

![Bar Chart](Image)

**Figure 3-17:** Effect of FR Linn leaf extract on GST level of brain against Cisplatin induced toxicity in mice.

Values are mean ± S.D. n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
Chapter 3: Results

3.1.5 The possible protective effects of the leaves extract of FR Linn on Cisplatin-induced Hepatotoxicity in mice

3.1.5.1 Study the transaminases (ALT, AST) and ALP activity of liver against Cisplatin induced toxicity in mice

Figures 3-18, 3-19 and 3-20, shows the effects of Cisplatin, and different extracts of FR on concentration of liver AST, ALT and ALP levels. As show in Figures 3-18, 3-19 and 3-20, Cisplatin resulted in significant decrease in concentration of liver transaminases and ALP levels compared to normal control group (p < 0.05). However, Administration of ethanol and methanol extract of FR for 15 consecutive days was found to increase the levels of liver transaminases and ALP significantly when compared to NCG group (p < 0.05).
Figures 3-18, 3-19 and 3-20: The effect of FR Linn on AST, ALT and ALP concentration of liver in mice induced toxicity by Cisplatin.

Values are mean ± S.D. n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG group (p< 0.05).
3.1.5.2 Study the serum levels of total protein, albumin and bilirubin

The effect of extracts of FR on serum levels of total protein, albumin and bilirubin were reported in Tables 3-4.

In NCG, Cisplatin injection (5mg/kg) significantly decreased the level of serum protein and albumin and increased the level of bilirubin in serum. As shown in Tables 3-4, administration of FR, recovered serum levels of protein and albumin near to normal content. Although, this reduction was dose dependent up to 1000 (mg/kg BW). FR also decreased the toxicity of Cisplatin on liver with reference to decreased level of bilirubin in serum.
Table 3-4: Effect of different extracts of FR Linn leaf, on serum protein, albumin and bilirubin levels of mice induced with Cisplatin toxicity.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Parameters</th>
<th>protein (g/dL)</th>
<th>albumin (mg/dL)</th>
<th>bilirubin (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>6.27±0.7</td>
<td>4.5±0.5</td>
<td>0.66±0.2</td>
</tr>
<tr>
<td>NCG</td>
<td></td>
<td>4.15±0.8*</td>
<td>2.7±0.6*</td>
<td>1.84±0.3*</td>
</tr>
<tr>
<td>FRA 250</td>
<td></td>
<td>4.22±0.5</td>
<td>2.7±0.4</td>
<td>0.85±0.4</td>
</tr>
<tr>
<td>FRA 500</td>
<td></td>
<td>5.02±0.7**</td>
<td>3.3±0.4**</td>
<td>1.2±0.2**</td>
</tr>
<tr>
<td>FRA 1000</td>
<td></td>
<td>5.74±0.2**</td>
<td>3.4±0.6**</td>
<td>1.7±0.14**</td>
</tr>
<tr>
<td>FRE 250</td>
<td></td>
<td>4.02±0.4</td>
<td>2.3±0.5</td>
<td>0.75±0.23</td>
</tr>
<tr>
<td>FRE 500</td>
<td></td>
<td>4.28±0.4</td>
<td>3.5±0.3**</td>
<td>1.77±0.21**</td>
</tr>
<tr>
<td>FRE 1000</td>
<td></td>
<td>4.5±0.6</td>
<td>4.8±0.6**</td>
<td>1.6±0.17**</td>
</tr>
<tr>
<td>FRM 250</td>
<td></td>
<td>4.11±0.7</td>
<td>2.8±0.3</td>
<td>0.65±0.11</td>
</tr>
<tr>
<td>FRM 500</td>
<td></td>
<td>4.35±0.5</td>
<td>2.8±0.4</td>
<td>0.63±0.32</td>
</tr>
<tr>
<td>FRM 1000</td>
<td></td>
<td>5.27±0.3**</td>
<td>3.2±0.5**</td>
<td>0.95±0.42**</td>
</tr>
</tbody>
</table>

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG group (p< 0.05).
3.1.5.3 Effect of FR Linn leaf extract on the MDA level of liver against Cisplatin induced toxicity in mice

As showed in Figure 3-21, Cisplatin treatment increased the MDA level of liver significantly ($P < 0.05$) in the Cisplatin-treated animals (NCG). However, treatment of animals with ethanolic and methanolic extract of FR reduced the elevated level of MDA significantly ($p < 0.05$).

![Figure 3-21](image-url)

**Figure 3-21:** Effect of FR Linn leaf, extract on the MDA level of liver, against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group ($p < 0.05$).

** Indicate significance compared to NCG ($p < 0.05$).
3.1.6 Effect of FR Linn extract on the enzymatic antioxidant defense system of liver against Cisplatin toxicity in mice

3.1.6.1 Effect of FR Linn leaf extract on the GSH level of liver against Cisplatin induced toxicity in mice

As seen from Figure 3-22, GSH level of liver was lower in the NCG group compared with the control values. Treatment with ethanol and methanol extracts of FR elevated the activity of brain GSH in mice induce toxicity by Cisplatin (p < 0.05).

![Figure 3-22: Effect of FR Linn leaf, extract on the GSH level of liver, against Cisplatin induced toxicity in mice.](image)

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.1.6.2 Effect of FR Linn leaf extract on the SOD level of liver against Cisplatin induced toxicity in mice

As shown in Figure 3-23, SOD level of liver was lower in the NCG group. Treatment of animals with all extracts FR elevated the level of liver SOD significantly, when compared to NCG (p < 0.05). Lower dosages of ethanol and methanol extracts also showed protective effect against reduced GSH activity by Cisplatin significantly (p < 0.05).

![Figure 3-23: Effect of FR Linn leaf, extract on the SOD level of liver, against Cisplatin induced toxicity in mice.](image)

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.1.6.3 Effect of FR Linn leaf extract on the CAT level of liver against Cisplatin induced toxicity in mice

As seen from Figure 3-24, CAT level of liver, was lower in the NCG group compared with the control values. The metanolic and ethanolic extracts of FR elevated CAT concentration of liver near to normal levels in Cisplatin induced mice. However, the aqueous extract of FR did not show any significant changes in CAT level of liver (p < 0.05).

Figure 3-24: Effect of FR Linn leaf, extract on the CAT level of liver, against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.1.6.4 Effect of FR Linn leaf extract on the GR level of liver against Cisplatin induced toxicity in mice

As reported in Figure 3-25, GR level of liver, was lower in the NCG group compared with the control values. Treatment the animals with different extracts of FR increased the GR activity of liver near to normal levels compared to normal group (p < 0.05).

**Figure 3-25:** Effect of FR Linn leaf, extract on the GR level of liver, against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.1.6.5 Effect of FR Linn leaf extract on the GST level of liver against Cisplatin induced toxicity in mice

As reported in Figure 3-26, GST level of liver, was lower in the NCG group compared with the control values. Ethanolic and methanolic extracts of FR increased the reduced levels of GST in liver of mice induced with Cisplatin, significantly (p < 0.05).

**Figure 3-26:** Effect of FR Linn leaf, extract on the GST level of liver, against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.1.7 The possible protective effects of the leaves extract of FR Linn on Cisplatin-induced Nephrotoxicity in mice

3.1.7.1 Study the serum levels of BUN and Cr

Cisplatin injection induced the nephrotoxicity in mice with reference to increased serum BUN and Cr levels in mice (Figures 3-27 and 3-28). The concentration of serum Cr and BUN levels was significantly elevated (P < 0.05) in the Cisplatin-treated animals (NCG) compared to the normal group. Treatment of animals with different extracts of FR significantly reduced the elevated levels of serum BUN and Cr. The treatment of mice with the methanolic extract of FR (1000 mg/kg BW), was able to lower the serum BUN and Cr to almost normal level, significantly compared to NCG (P < 0.05).
Figures 3-27 and 3-28: Effect of leaf extract of FR Linn, on the serum levels of BUN and Cr, in mice induced by Cisplatin toxicity.
Values are mean ± S.D, n = 6
* Indicate significance compared to control group (p< 0.05).
** Indicate significance compared to NCG (p< 0.05).
3.1.7.2 Effect of FR Linn leaf extract on the MDA level of kidney against Cisplatin induced toxicity in mice

As showed in Figure 3-29, MDA level of kidney was significantly elevated \((P < 0.05)\) in the Cisplatin-treated animals compared to the normal group. However, treatment of animals with methanolic extract of the FR at the high dosage (1000mg/kg BW) lowers the elevated MDA level of kidney significantly elevated \((P < 0.05)\).

**Figure 3-29:** Effect of leaf extract of FR Linn, on the MDA level of kidney, in mice induced by Cisplatin toxicity.

Values are mean ± S.D, \(n = 6\)

* Indicate significance compared to control group \((p< 0.05)\).

** Indicate significance compared to NCG \((p< 0.05)\).
3.1.8 Effect of FR Linn extract on the enzymatic antioxidant defense system of kidney against Cisplatin toxicity in mice

3.1.8.1 Effect of FR Linn leaf extract on the GSH level of kidney against Cisplatin induced toxicity in mice

As shown in Figure 3-30, GSH level of kidney were lower in the NCG group compared with the control values. The methanolic extract of FR extract increased the activity of kidney GSH significantly (p < 0.05) when compared to NCG. However, treatment of mice with aqueous and ethanolic extracts of FR did not affect the reduced levels of GSH in kidney.

![Figure 3-30: Effect of leaf extract of FR Linn, on the GSH level of kidney, in mice induced by Cisplatin toxicity.](image)

Values are mean ± S.D, n = 6
* Indicate significance compared to control group (p< 0.05).
** Indicate significance compared to NCG (p< 0.05).
3.1.8.2 Effect of FR Linn leaf extract on the CAT level of kidney against Cisplatin induced toxicity in mice

As seen from Figure 3-31, CAT level of kidney, was lower in the NCG group compared with the control values. The methanolic extracts of FR increased the CAT activity of kidney in mice induced toxicity by Cisplatin. However this elevation was significant only at the higher dosage of FRM (p < 0.05).

**Figure 3-31:** Effect of leaf extract of FR Linn, on the CAT level of kidney, in mice induced by Cisplatin toxicity.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.1.8.3 Effect of FR Linn leaf extract on the SOD level of kidney against Cisplatin induced toxicity in mice

As seen in Figure 3-32, SOD level of kidney, was lower in the NCG group compared with the control values. Treatment of animals with the different extracts of FR (Aquueuse, ethanol and methanol), increased the levels of kidney SOD in mice induced toxicity with Cisplatin. However just the high concentration of extracts made the changes on reduced levels of SOD in kidney when compared to NCG (p < 0.05).

Figure 3-32: Effect of leaf extract of FR Linn, on the SOD level of kidney, in mice induced by Cisplatin toxicity.
Values are mean ± S.D, n = 6
* Indicate significance compared to control group (p< 0.05).
** Indicate significance compared to NCG (p< 0.05).
3.1.8.4 Effect of FR Linn leaf extract on the GR level of kidney against Cisplatin induced toxicity in mice

As seen in Figure 3-33, GR level of kidney, was lower in the NCG group compared with the control values. Treatment of animals with the different extracts of FR increased the activity of kidney SOD in mice induced with Cisplatin. However changes on reduced level of GR was dose dependent on different extracts (p < 0.05).

Figure 3-33: Effect of leaf extract of FR Linn, on the GR level of kidney, in mice induced by Cisplatin toxicity.
Values are mean ± S.D, n = 6
* Indicate significance compared to control group (p< 0.05).
** Indicate significance compared to NCG (p< 0.05).
3.1.8.5 Effect of FR Linn leaf extract on the GST level of kidney against Cisplatin induced toxicity in mice

As seen in Figure 3-34, GST level of kidney was lower in the NCG group compared with the normal values. Treatment of animals with different extracts of FR increased the GST activity of kidney near to normal levels with a dose dependent manner, when compared to NCG (p < 0.05).

Figure 3-34: Effect of leaf extract of FR Linn, on the GST level of kidney, in mice induced by Cisplatin toxicity.
Values are mean ± S.D, n = 6
* Indicate significance compared to control group (p< 0.05).
** Indicate significance compared to NCG (p< 0.05).
3.2 Evaluation of possible protective effects of the leaves extract of FB Linn on Cisplatin-induced Hepatotoxicity, Nephrotoxicity and Neurotoxicity in mice (PART B)

3.2.1 Study of the phytochemical profiles of the leaves extract of FB Linn

3.2.1.1 The phytochemical screening assay

The phytochemical screening of different extracts of FB Linn, has shown in Table 3-5. Primary screening of different leaf extracts of FB demonstrated the presence of Glycosides, Carbohydrates, Tannins, Flavonoids, Triterpenoids in the all extracts.

Table 3-5: Phytochemical screening assay on leaf extracts of FB Linn

<table>
<thead>
<tr>
<th>Plant constituents</th>
<th>FBA</th>
<th>FBE</th>
<th>FBM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saponins</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Glycosides</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Tannins</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Steroids</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Triterpenoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
3.2.1.2 Study the total phenolics, flavonoids, and tanins contents

Among the different extracts of FB Linn leaf, the methanolic extract offered the highest phenolic (131.9 mg GAE/ g plant extract), flavonoids (73.3 mg RE/g plant extract) and taninss (27.5 mg GAE/g plant extract) content.

Aqueous extract of FB showed the lower content of phenolic (57.2 mg GAE/ g plant extract), flavonoids (46.3 mg RE/g plant extract) and tanins content (20.7 mg GAE/ g plant extract).

Table 3-6: Total phenolic, flavonoids, and tanin contents in the different leaf extracts of FB Linn.

<table>
<thead>
<tr>
<th>Extract</th>
<th>Total phenolic Content (mg GAE/g plant extract)</th>
<th>Total flavonoids content (mg RE/g plant extract)</th>
<th>Total tanin content (mg GAE/g plant extract)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBA</td>
<td>42.8 ± 5.2 a</td>
<td>25.8 ± 2.6 a</td>
<td>11.6 ± 2.4 a</td>
</tr>
<tr>
<td>FBE</td>
<td>51.2 ± 6.8 b</td>
<td>42.6 ± 3.8 b</td>
<td>20.2 ± 2.7 b</td>
</tr>
<tr>
<td>FBM</td>
<td>57.2 ± 4.5 b</td>
<td>46.3 ± 3.7 b</td>
<td>20.7 ± 1.9 b</td>
</tr>
</tbody>
</table>

Each value in the table is represented as mean ± SD (n = 5). Values in the same column followed by a different letter are significantly different (P < 0.05).
3.2.1.3 Hydrogen peroxide scavenging capacity

Hydrogen peroxide inhibition activity of different leaf extracts of FB have presented in Table 3-7. Hydrogen peroxide inhibition activity was observed to be more as the concentrated extract. As shown in Table 3-7, higher concentration of the extracts offered the higher potential to scavenging activity in radicals of Hydrogen peroxide significantly (P < 0.05).

Table 3-7: Hydrogen peroxide radical scavenging capacity of aqueous, ethanolic and mthanolic extracts of FB Linn leaf.

<table>
<thead>
<tr>
<th>Concentration (µg/ml)</th>
<th>FBA</th>
<th>FBE</th>
<th>FBM</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>6.2 ± 0.9*</td>
<td>7.3 ± 1.5*</td>
<td>11.3±1.7*</td>
</tr>
<tr>
<td>200</td>
<td>8.1 ± 2.2 b</td>
<td>9.6 ± 1.6 b</td>
<td>13.8±2.3 b</td>
</tr>
<tr>
<td>300</td>
<td>8.9 ± 1.4 b</td>
<td>10.9 ± 2.4 c</td>
<td>14.5±2.8 b</td>
</tr>
<tr>
<td>400</td>
<td>10.1 ± 1.6 c</td>
<td>10.7 ± 2.1 c</td>
<td>15.9±3.6 c</td>
</tr>
<tr>
<td>500</td>
<td>11.8 ± 2.7 d</td>
<td>11.3 ± 1.3 d</td>
<td>16.2±1.9 c</td>
</tr>
</tbody>
</table>

Each value in the table is represented as mean ± SD (n = 3). Values in the same column followed by a different letter are significantly different (P < 0.05).
3.2.1.4 The Reducing power assay

The anti-oxidative potential of the aqueous, ethanol and methanol extracts of FB Linn leaf, has shown in Figure 3-35. Higher reducing power is observed in more concentrated extract. The methanolic extracts of plants showed the higher reducing power.

![Graph showing reducing power assay](image)

**Figure 3-35**: Reducing power of aqueous, ethanolic and methanolic extracts of FB Linn leaf, at different concentrations.

Each value in the table is represented as mean ± SD (n = 3).
3.2.1.5 Study of the superoxide scavenging activity

The ranking order for superoxide scavenging activity, compared to ascorbic acid, was FBM > FBE > FBA (Figure 3-36); The higher percentage of superoxide radical scavenging activity was evident in FBM fractions (42.57±4.31 μg/ml) at 50 μg/ml significantly (P < 0.05).

![Figure 3-36: Superoxide anion scavenging capacity of aqueous, ethanolic and methanolic extracts of FB Linn leaf. Each value in the table is represented as mean ± SD (n = 3).](image-url)
3.2.1.6 Study of the Hydroxyl radical scavenging activity

The hydroxyl radical scavenging activity of fractions can be ranked as FBM > FBE > FBA. All fractions showed dose dependent antioxidant activity (Figure 3-37). In the present investigation, the value of hydroxyl radical scavenging activity for the FBM was $31.43 \pm 2.4 \mu g/ml$ as the higher activity at 50 $\mu g/ml$ significantly ($P < 0.05$).

![Hydroxyl Radical Scavenging Activity](image)

**Figure 3-37:** Hydroxyl radical scavenging capacity of aqueous, ethanolic and methanolic extracts of FB Linn leaf.

Each value in the table is represented as mean $\pm$ SD ($n = 3$).
3.2.2 The acute toxicity studies on the different leaf extracts of FB Linn in mice

3.2.2.1 Study the serum transaminases (ALT, AST) and ALP activity

Administration of the aqueous, ethanol and methanolic extracts of FB, at the different doses, did not produce any significant (p < 0.05) changes in serum ALT, AST and ALP levels, compared to vehicle control group (Figures 3-38, 3-39 and 3-40).
**Figures 3-38, 3-39 and 3-40:** Effect of leaf extract of FB Linn on the serum levels of ALT, AST and ALP in normal mice.

Values are mean ± S.D, n = 6
3.2.2.2 Study the serum levels of BUN and Cr

As shown in figures 3-41 and 3-42 administration of the aqueous, ethanol and methanolic extracts of FB, at the different doses, did not produce any significant ($p < 0.05$) changes in serum levels of BUN and Cr, compared to vehicle control group (Figures 3-41 and 3-42).

**Figures 3-41 and 3-42**: Effect of leaf extract of FB Linn, on the serum levels of BUN and Cr in normal mice.

Values are mean ± S.D, n = 6
3.2.3 The possible protective effects of the leaves extract of FB Linn on Cisplatin-induced Neurotoxicity in mice

3.2.3.1 Study the transaminases (ALT, AST) and ALP activity of brain

Cisplatin administration in NCG, resulted in a significant decrease in the ALT, AST and ALP levels of brain (p < 0.05); respectively; compared to control group. However, different extracts of FB, did not make any changes on increased levels of brain transaminases and ALP content, compared to normal control group (Figures 3-43, 3-44 and 3-45).
Figures 3-43, 3-44 and 3-45: The effect of FB Linn on AST, ALT and ALP concentration of brain in mice induced toxicity by Cisplatin.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).
3.2.3.2 Effect of FB Linn leaf extract on the MDA level of brain against Cisplatin induced toxicity in mice

As showed in Figure 3-46, Cisplatin injection induced the elevation of MDA level in brain tissue significantly ($P < 0.05$).

However, treatment of animals with methanolic extract of FB affected the elevated level of MDA of brain at the high concentration significantly ($P < 0.05$).

![Graph showing MDA concentration against different plant extracts](image)

**Figure 3-46:*** Effect of FB Linn leaf extract on the MDA level of brain, against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group ($p< 0.05$).

** Indicate significance compared to NCG ($p< 0.05$).
3.2.4 Effect of FB Linn extract on the enzymatic antioxidant defense system of brain against Cisplatin toxicity in mice

3.2.1.1 Effect of FB Linn leaf extract on the GSH level of brain against Cisplatin induced toxicity in mice

As seen from Figure 3-47, GSH level of brain was lower in the NCG group compared with the control values. Treatment with ethanolic and methanolic extract of FB elevated the activity of brain GSH in the mice induced with Cisplatin toxicity. However, treatment of aqueous extract of FB did not increase the GSH activity of brain (p < 0.05).

![Graph showing GSH concentration changes with different concentrations of plant extracts](image)

**Figure 3-47:** Effect of FB Linn leaf extract on GSH level of brain against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.2.4.2 Effect of FB Linn leaf extract on the SOD level of brain against Cisplatin induced toxicity in mice

As see in Figure 3-48, SOD level of brain was lower in the NCG group compared with the control values. Treatment the animals with high concentration of the methanolic extract of FB elevated the level of brain SOD significantly (p < 0.05) in the mice induced with Cisplatin toxicity.

**Figure 3-48:** Effect of FB Linn leaf extract on SOD level of brain against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
### 3.2.4.3 Effect of FB Linn leaf extract on the CAT level of brain against Cisplatin induced toxicity in mice

As seen from Figure 3-49, CAT level of brain, was lower in the NCG group compared with the control values.

Treatment of animals with the ethanolic and methanolic extracts of *Ficus religiosa* elevated the activity of brain CAT near to normal levels in mice induced toxicity by Cisplatin significantly (p < 0.05).

![Figure 3-49](image)

**Figure 3-49:** Effect of FB Linn leaf extract on CAT level of brain against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.2.4.4 Effect of FB Linn leaf extract on the GR level of brain against Cisplatin induced toxicity in mice

As reported in Figure 3-50, GR level of brain, was lower in the NCG group compared with the control values. Treatment of animals with different extracts of FB did not affect the reduced level of GR level in brain (p < 0.05).

**Figure 3-50:** Effect of FB Linn leaf extract on GR level of brain against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.2.4.5 Effect of FB Linn leaf extract on the GST level of brain against Cisplatin induced toxicity in mice

As seen in Figure 3-51, GST level of brain, was lower in the NCG group compared with the control values. Treatment with different extracts of FB did not increased the GST activity of brain in mice induced with Cisplatin toxicity (p < 0.05).

Figure 3-51: Effect of FB Linn leaf extract on GST level of brain against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.2.5 The possible protective effects of the leaves extract of FB Linn on Cisplatin-induced Hepatotoxicity in mice

3.2.5.1 Study the transaminases (ALT, AST) and ALP activity of liver against Cisplatin induced toxicity in mice

Figures 3-52, 3-53 and 3-54 shows the effects of Cisplatin, and different extracts of FB on concentration of liver AST, ALT and ALP levels. Cisplatin resulted in significant decrease in concentration of liver transaminases and ALP compared to normal control group (p < 0.05). Administration of the methanol extract of FB for 15 consecutive days was found to increase the levels of liver transaminases and ALP significantly when compared to NCG group (p < 0.05). Furthermore, ethanolic extract of FB at the higher dosage increased the reduced level of ALP compared to NCG group (p < 0.05).
Chapter 3: Results

Figures 3-52, 3-53 and 3-54: The effect of FB Linn on AST, ALT and ALP concentration of liver in mice induced toxicity by Cisplatin.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG group (p< 0.05).
3.2.5.2 Study the serum levels of total protein, albumin and bilirubin

The effect of extracts of FB, on serum levels of total protein, albumin and bilirubin were reported in Tables 3-8.

In NCG, Cisplatin injection (5mg/kg) significantly decreased the levels of serum protein and albumin and increased the level of bilirubin in serum. As shown in Table 3-8, administration of the methanolic extract of FB, recovered serum levels of protein and albumin near to normal content. Although, this reduction was dose dependent up to 1000 (mg/kg BW). Different extracts of FB, also recovered the increased level of bilirubin significantly.
Table 3-8: Effect of FB Linn, leaf extract on serum protein, albumin and bilirubin levels of mice induced with Cisplatin toxicity.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Parameters</th>
<th>Protein (g/dL)</th>
<th>albumin (mg/dL)</th>
<th>bilirubin (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>7.13±1.3</td>
<td>6.5±0.7</td>
<td>0.75±0.5</td>
</tr>
<tr>
<td>NCG</td>
<td></td>
<td>5.03±0.9*</td>
<td>3.8±0.42*</td>
<td>2.21±0.4*</td>
</tr>
<tr>
<td>FBA 250</td>
<td></td>
<td>5.32±0.83</td>
<td>3.9±0.91</td>
<td>0.65±0.42</td>
</tr>
<tr>
<td>FBA 500</td>
<td></td>
<td>5.57±0.65</td>
<td>3.7±0.74</td>
<td>0.75±0.67</td>
</tr>
<tr>
<td>FBA 1000</td>
<td></td>
<td>5.12±0.68</td>
<td>3.6±0.63</td>
<td>0.4±0.45**</td>
</tr>
<tr>
<td>FBE 250</td>
<td></td>
<td>6.64±0.57</td>
<td>3.9±1.2</td>
<td>1.9±0.39</td>
</tr>
<tr>
<td>FBE 500</td>
<td></td>
<td>4.22±0.7</td>
<td>3.3±0.9</td>
<td>0.89±0.44**</td>
</tr>
<tr>
<td>FBE 1000</td>
<td></td>
<td>4.31±0.55</td>
<td>3.5±0.7</td>
<td>0.87±0.64**</td>
</tr>
<tr>
<td>FBM 250</td>
<td></td>
<td>4.29±0.63</td>
<td>3.6±1.3</td>
<td>1.19±0.22</td>
</tr>
<tr>
<td>FBM 500</td>
<td></td>
<td>4.5±0.8</td>
<td>4.17±0.5**</td>
<td>0.86±0.62**</td>
</tr>
<tr>
<td>FBM 1000</td>
<td></td>
<td>5.7±0.64**</td>
<td>5.22±0.9**</td>
<td>0.82±0.46**</td>
</tr>
</tbody>
</table>

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG group (p< 0.05).
3.2.5.3 Effect of FB Linn leaf extract on the MDA level of liver against Cisplatin induced toxicity in mice

As showed in Figure 3-55, MDA level of liver was significantly elevated ($P < 0.05$) in the Cisplatin-treated animals (NCG), compared to the normal group. Treatment of animals with methanolic extract of FB reduced the elevated level of MDA only at the higher dosage of FBM significantly ($p < 0.05$).

![Figure 3-55](image-url)

**Figure 3-55:** Effect of FB Linn leaf, extract on the MDA level of liver, against Cisplatin induced toxicity in mice.
Values are mean ± S.D, n = 6
* Indicate significance compared to control group ($p< 0.05$).
** Indicate significance compared to NCG ($p< 0.05$).
3.2.6 Effect of FB Linn extract on the enzymatic antioxidant defense system of liver against Cisplatin toxicity in mice

3.2.6.1 Effect of FB Linn leaf extract on the GSH level of liver against Cisplatin induced toxicity in mice

As seen from Figure 3-56, GSH level of liver was lower in the NCG group compared with the control values. Treatment with ethanol (1000 mg/kg) and methanol extracts (500 and 1000 mg/kg) of FB elevated the activity of liver GSH in mice at (p < 0.05).

![Graph showing GSH concentration with different plant extracts and concentrations](image)

**Figure 3-56:** Effect of FB Linn leaf extract on GSH level of liver against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6
* Indicate significance compared to control group (p< 0.05).
** Indicate significance compared to NCG (p< 0.05).
3.2.6.2 Effect of FB Linn leaf extract on the SOD level of liver against Cisplatin induced toxicity in mice

As shown in Figure 3-57, SOD level of liver was lower in the NCG group. Treatment of animals with different extracts of FR did not showed any protective potential against the reduced level of liver SOD activity against Cisplatin toxicity.

Figure 3-57: Effect of FB Linn leaf, extract on the SOD level of liver, against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6
* Indicate significance compared to control group (p< 0.05).
** Indicate significance compared to NCG (p< 0.05).
3.2.6.3 Effect of FB Linn leaf extract on the CAT level of liver against Cisplatin induced toxicity in mice

As seen from Figure 3-58, CAT level of liver, was lower in the NCG group compared with the control values. Treatment of animals with the methanolic extract of FB elevated the reduced activity of liver CAT in Cisplatin induced mice, only at the higher dosage (1000 mg/kg BW). However, the aqueous and ethanolic extract of FB did not affect the reduced level of CAT in mice induced toxicity with Cisplatin (p < 0.05).

![Figure 3-58: Effect of FB Linn leaf, extract on the CAT level of liver, against Cisplatin induced toxicity in mice.](image)

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.2.6.4 Effect of FB Linn leaf extract on the GR level of liver against Cisplatin induced toxicity in mice

As reported in Figure 3-59, GR level of liver, was lower in the NCG group compared with the control values. Treatment of animals with the different dosages of ethanol and methanol extracts (500 and 1000 mg/kg) increased the GR activity of liver near to normal levels significantly when compared to NCG ($p < 0.05$).

**Figure 3-59:** Effect of FB Linn leaf, extract on the GR level of liver, against Cisplatin induced toxicity in mice.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group ($p < 0.05$).

** Indicate significance compared to NCG ($p < 0.05$).
3.2.6.5 Effect of FB Linn leaf extract on the GST level of liver against Cisplatin induced toxicity in mice

As reported in Figure 3-60, GST level of liver, was lower in the NCG group compared with the control values. Treatment with the methanol extracts of FB increased the GST activity of liver near to normal levels (p < 0.05). However treatment of animals with aqueous and ethanolic extract of FB did not make any significant changes in reduced level of liver GST (p < 0.05).

![Figure 3-60: Effect of FB Linn leaf, extract on the GST level of liver, against Cisplatin induced toxicity in mice.](image)

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.2.7 The possible protective effects of the leaves extract of FB Linn on Cisplatin-induced Nephrotoxicity in mice

3.2.7.1 Study the serum levels of BUN and Cr

As showed in Figures 3-61 and 3-62, serum levels of BUN and Cr were significantly elevated ($P < 0.05$) in the Cisplatin-treated animals compared to the normal group. Treatment of animals with different extract of FB did reduce the elevated levels of serum BUN. However, treatment of animals with the different extracts of FB lowered the serum Cr level to almost normal levels, compared to NCG ($P < 0.05$).

![Graph of BUN and Cr levels](image)

**Figure 3-61 and 3-62**: Effect of leaf extract of FB Linn, on the serum levels of BUN and Cr, in mice induced by Cisplatin toxicity.

Values are mean ± S.D, $n = 6$

* Indicate significance compared to control group ($p < 0.05$).

** Indicate significance compared to NCG ($p < 0.05$).
3.2.7.2 Effect of FB Linn leaf extract on the MDA level of kidney against Cisplatin induced toxicity in mice

As showed in Figure 3-63, MDA level of kidney was significantly elevated ($P < 0.05$) in the Cisplatin-treated animals compared to the normal group. Treatment of animals with methanolic extract of the FB could not be able to lowers the elevated MDA level of kidney, compared to NCG ($P < 0.05$).

![Figure 3-63](image)

**Figure 3-63:** Effect of leaf extract of FB Linn, on the MDA level of kidney, in mice induced by Cisplatin toxicity.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group ($p< 0.05$).

** Indicate significance compared to NCG ($p< 0.05$).
3.2.8 Effect of FB Linn extract on the enzymatic antioxidant defense system of kidney against Cisplatin toxicity in mice

3.2.8.1 Effect of FB Linn leaf extract on the GSH level of kidney against Cisplatin induced toxicity in mice

As shown in Figure 3-64, GSH level of kidney were lower in the NCG group compared with the control values. The high concentrations of the methanolic extract of FB elevated the activity of kidney GSH significantly, compared to NCG (p < 0.05). Aqueous and ethanolic extracts of FB was not able to increase the GSH level of kidney.

Figure 3-64: Effect of leaf extract of FB Linn, on the GSH level of kidney, in mice induced by Cisplatin toxicity.
Values are mean ± S.D, n = 6
* Indicate significance compared to control group (p< 0.05).
** Indicate significance compared to NCG (p< 0.05).
3.2.8.2 Effect of FB Linn leaf extract on the SOD level of kidney against Cisplatin induced toxicity in mice

As shown in Figure 3-65, SOD level of kidney was lower in the NCG group compared with the control values. The high concentrations of different extracts of FB (1000mg/kg) elevated the SOD level of kidney significantly (p < 0.05) in the mice induced with Cisplatin toxicity.

**Figure 3-65:** Effect of leaf extract of FB Linn, on the SOD level of kidney, in mice induced by Cisplatin toxicity.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.2.8.3 Effect of FB Linn leaf extract on the CAT level of kidney against Cisplatin induced toxicity in mice

As seen from Figure 3-66, CAT level of kidney, was lower in the NCG group compared with the control values. Treatment with the methanolic extract of FB elevated the activity of CAT in kidney compared to normal group significantly (p < 0.05). Aqueuse and methanolic extracts of FB leaf did not showed any significant changes in CAT level of kidney, compared to NCG (p < 0.05).

**Figure 3-66:** Effect of leaf extract of FB Linn, on the CAT level of kidney, in mice induced by Cisplatin toxicity.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.2.8.4 Effect of FB Linn leaf extract on the GR level of kidney against Cisplatin induced toxicity in mice

As seen in Figure 3-67, GR level of kidney, was lower in the NCG group compared with the control values. Treatment of animals with the different extracts of FB, increased the reduced levels of GR in kidney of mice induced toxicity by Cisplatin (p < 0.05).

![Bar graph showing the effect of leaf extract of FB Linn on the GR level of kidney in mice induced by Cisplatin toxicity.](image)

**Figure 3-67:** Effect of leaf extract of FB Linn, on the GR level of kidney, in mice induced by Cisplatin toxicity.

Values are mean ± S.D, n = 6

* Indicate significance compared to control group (p< 0.05).

** Indicate significance compared to NCG (p< 0.05).
3.2.8.5 Effect of FB Linn leaf extract on the GST level of kidney against Cisplatin induced toxicity in mice

As seen in Figure 3-68, GST level of kidney was lower in the NCG group compared with the normal values. Treatment of animals with different extracts of FB increased the GST activity of kidney significantly, when compared to NCG (p < 0.05).

**Figure 3-68:** Effect of leaf extract of FB Linn, on the GST level of kidney, in mice induced by Cisplatin toxicity.

Values are mean ± S.D, n = 6
* Indicate significance compared to control group (p< 0.05).
** Indicate significance compared to NCG (p< 0.05).