Fig: 19-Effects of *E. scaber* crude extracts on plasma glucose levels in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with streptozotocin diabetic rats.
c - compared with dia + petr.ether extract.
d - compared with dia + hexane extract.
e - compared with dia + ethyl acetate extract.
f - compared with dia + methanol extract.
g - compared with dia + aqueous extract.
h - compared with dia+insulin.
Each value represents mean ± SD of 6 rats.
Significance at: p<0.05
a - compared with normal rats.
b - compared with streptozotocin diabetic rats.
c - compared with dia + F1.
d - compared with dia + F2.
e - compared with dia + F3.
f - compared with dia + F4.
g - compared with dia + F5.
h - compared with dia + insulin.

Fig: 20 - Short term effects of *E. scaber* fractions on plasma glucose levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.
Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with streptozotocin diabetic rats.
c - compared with nor + lup.
d - compared with dia + lup (5mg/kgwt).
e - compared with dia + lup (15mg/kgwt).
f - compared with dia + lup (20mg/kgwt).
g - compared with dia + insulin.
Fig. 22- Effect of Lupeol on glucose tolerance test in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.
Significance at: p<0.05
a - compared with 0 mins.
b - compared with 30 mins.
c - compared with 60 mins.
d - compared with 90 mins.
e - compared with 120 mins.
f - compared with 180 mins.
Fig: 23- Effects of *E. scaber* crude extracts on body weight in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.
Significance at: p<0.05

- a - compared with normal rats.
- b - compared with streptozotocin diabetic rats.
- c - compared with dia + petr.ether extract.
- d - compared with dia + hexane extract.
- e - compared with dia + ethyl acetate extract.
- f - compared with dia + methanol extract.
- g - compared with dia + aqueous extract.
- h - compared with dia + insulin.
Fig:24-Effects of lupeol on body weight in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a -compared with normal rats.
b -compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d -compared with dia + lup.
e -compared with dia + insulin.
Fig 25: Effects of *E. scaber* crude extracts on food and water intake in normal and Streptozotocin-induced diabetic male albino Wistar rats.

Each value represents mean ± SD of 6 rats. Significance at: p<0.05

- a - compared with normal rats.
- b - compared with streptozotocin diabetic rats.
- c - compared with dia + petr.ether extract.
- d - compared with dia + hexane extract.
- e - compared with dia + ethyl acetate extract.
- f - compared with dia + methanol extract.
- g - compared with dia + aqueous extract.
- h - compared with dia + insulin.
Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.

Fig:26-Effects of lupeol on food and water intake in normal and Streptozotocin-induced diabetic male albino Wistar rats
Each value represents mean ± SD of 6 rats. 
Significance at : p<0.05
a - compared with normal rats.
b - compared with streptozotocin diabetic rats.
c - compared with dia + petr.ether extract.
d - compared with dia + hexane extract.
e - compared with dia + ethyl acetate extract.
f - compared with dia + methanol extract.
g - compared with dia + aqueous extract.
h - compared with dia + insulin.

Fig:27-Effects of *E.scaber* crude extracts on Hemoglobin and Glycosylated haemoglobin levels in normal and Streptozotocin-induced diabetic male albino Wistar rats
Fig: 28 - Effects of lupeol on Hemoglobin and Glycosylated haemoglobin levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.

Each value represents mean ± SD of 6 rats. Significance at: p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Fig:29-Effects of *E. scaber* crude extracts on muscle glycogen and liver glycogen levels in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.

Significance at : p<0.05

- a - compared with normal rats.
- b - compared with streptozotocin diabetic rats.
- c - compared with dia + petr.ether extract.
- d - compared with dia + hexane extract.
- e - compared with dia + ethyl acetate extract.
- f - compared with dia + methanol extract.
- g - compared with dia + aqueous extract.
- h - compared with dia + insulin.
Fig: 30 - Effects of lupeol on muscle glycogen and liver glycogen levels in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with streptozotocin diabetic rats.
c - compared with dia + petr.ether extract.
d - compared with dia + hexane extract.
e - compared with dia + ethyl acetate extract.
f - compared with dia + methanol extract.
g - compared with dia + aqueous extract.
h - compared with dia + insulin.
Fig: 32 - Effect of lupeol on Plasma insulin and C-peptide levels in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Fig: 33 - Effects of *E. scaber* crude extracts on serum uric acid and creatinine levels in normal and Streptozotocin-induced diabetic male albino Wistar.

Each value represents mean ± SD of 6 rats.

Significance at : p<0.05

- a - compared with normal rats.
- b - compared with streptozotocin diabetic rats.
- c - compared with dia + petr.ether extract.
- d - compared with dia + hexane extract.
- e - compared with dia + ethyl acetate extract.
- f - compared with dia + methanol extract.
- g - compared with dia + aqueous extract.
- h - compared with dia + insulin.
Fig:34-Effects of lupeol on serum uric acid and creatinine levels in normal and Streptozotocin-induced diabetic male albino Wistar

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a -compared with normal rats.
b -compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d -compared with dia + lup.
e -compared with dia + insulin.
Each value represents mean ± SD of 6 rats. Significance at : p<0.05

a - compared with normal rats.
b - compared with streptozotocin diabetic rats.
c - compared with dia + petr.ether extract.
d - compared with dia + hexane extract.
e - compared with dia + ethyl acetate extract.
f - compared with dia + methanol extract.
g - compared with dia + aqueous extract.
h - compared with dia + insulin.

Fig:35-Effects of *E. scaber* crude extracts on serum urea and total protein levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.
Fig: 36- Effect of lupeol on serum urea and total protein levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.

Each value represents mean ± SD of 6 rats.
Significance at: p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with streptozotocin diabetic rats.
c - compared with dia + petr.ether extract.
d - compared with dia + hexane extract.
e - compared with dia + ethyl acetate extract.
f - compared with dia + methanol extract.
g - compared with dia + aqueous extract.
h - compared with dia + insulin.

Fig:37-Effect of *E. scaber* crude extracts on serum total cholesterol and triglyceride levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.
Fig 38 - Effect of lupeol on serum total cholesterol and triglyceride levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.

- Each value represents mean ± SD of 6 rats.
- Significance at: p<0.05
- a - compared with normal rats.
- b - compared with nor + lup.
- c - compared with streptozotocin diabetic rats.
- d - compared with dia + lup.
- e - compared with dia + insulin.
Fig: 39 - Effects of *E. scaber* crude extracts on serum HDL, LDL and VLDL levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.

Each value represents mean ± SD of 6 rats.

Significance at: p<0.05

- a - compared with normal rats.
- b - compared with streptozotocin diabetic rats.
- c - compared with dia + petr. ether extract.
- d - compared with dia + hexane extract.
- e - compared with dia + ethyl acetate extract.
- f - compared with dia + methanol extract.
- g - compared with dia + aqueous extract.
- h - compared with dia + insulin.
Each value represents mean ± SD of 6 rats.
Significance at: p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.

Fig:40-Effects of lupeol on serum HDL, LDL and VLDL levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.
Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with streptozotocin diabetic rats.
c - compared with dia + petr.ether extract.
d - compared with dia + hexane extract.
e - compared with dia + ethyl acetate extract.
f - compared with dia + methanol extract.
g - compared with dia + aqueous extract.
h - compared with dia+insulin.
Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Fig 44: Effect of lupeol on erythrocyte and tissue Na\textsuperscript{+}, K\textsuperscript{+} ATPase levels in normal and Streptozotocin-induced diabetic male Albino Wistar rats for 60 days treatment.

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Fig:45-Effect of lupeol on erythrocyte and tissue Ca2+ ATPase levels in normal and Streptozotocin-induced diabetic male Albino Wistar rats for 60 days treatment.

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a -compared with normal rats.
b -compared with nor + lup.
c -compared with streptozotocin diabetic rats.
d -compared with dia + lup.
e -compared with dia + insulin.
Fig:46-Effect of lupeol on erythrocyte and tissue Mg^{2+} ATPase levels in normal and Streptozotocin-induced diabetic male Albino Wistar rats for 60 days treatment.

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Fig: 47 - Effect of lupeol on serum Albumin, Globulin and Total Protein levels in normal and Streptozotocin-induced diabetic male Albino Wistar rats for 60 days treatment.

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Each value represents mean ± SD of 6 rats. Significance at: p<0.05
- a - compared with normal rats.
- b - compared with nor + lup.
- c - compared with streptozotocin diabetic rats.
- d - compared with dia + lup.
- e - compared with dia + insulin.
Fig:49-Effect of lupeol on plasma and tissue total hexosamine levels in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.

Significance at: p<0.05

- a - compared with normal rats.
- b - compared with nor + lup.
- c - compared with streptozotocin diabetic rats.
- d - compared with dia + lup.
- e - compared with dia + insulin.
Fig:50-Effect of lupeol on plasma and tissue sialic acid levels in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.
Significance at: p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Each value represents mean ± SD of 6 rats.
Significance at: p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Fig: 52-Effects of lupeol on serum glucokinase, glucose-6-phosphatase and fructose 1,6-bisphosphatase levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.

Each value represents mean ± SD of 6 rats.
Significance at: p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Fig: 53- Effect of lupeol tissue glucokinase levels in normal and Streptozotocin-induced diabetic male albino Wistar rats

- Each value represents mean ± SD of 6 rats.
- Significance at: p<0.05
- a - compared with normal rats.
- b - compared with nor + lup.
- c - compared with streptozotocin diabetic rats.
- d - compared with dia + lup.
- e - compared with dia + insulin.
Fig: Effects of lupeol on tissue glucose-6-phosphate levels in normal and Streptozotocin-induced diabetic male albino Wistar rats

Each value represents mean ± SD of 6 rats.
Significance at: p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Fig: Effects of lupeol on tissue fructose 1,6- bis phosphatase levels in normal and Streptozotocin-induced diabetic male albino Wistar rats

- Each value represents mean ± SD of 6 rats.
- Significance at: p<0.05
- a - compared with normal rats.
- b - compared with nor + lup.
- c - compared with streptozotocin diabetic rats.
- d - compared with dia + lup.
- e - compared with dia + insulin.
Fig:56-Effects of lupeol on tissue glycogen synthase and glycogen phosphorylase levels in normal and Streptozotocin-induced diabetic male albino Wistar rats.

Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Each value represents mean ± SD of 6 rats.
Significance at : p<0.05
a - compared with normal rats.
b - compared with nor + lup.
c - compared with streptozotocin diabetic rats.
d - compared with dia + lup.
e - compared with dia + insulin.
Fig:77: The time course of Lupeol release from lupeol-loaded nanoparticles

Each value represents mean ±SD of 6 experiments
**Fig-59**

a. Photomicrograph of an islet of normal rat. Nuclei of the islet cells are round or ovoid. I, islet of Langerhans; A, acinar tissue, C, capillary. [Paraffin section, Hematoxylin & Eosin (H & E); x 400].

b. Semithin section of pancreas of normal rat showing an islet of Langerhans. Nuclei of the islet cells are round or ovoid. I, islet of Langerhans; A, acinar tissue; C, capillary. [Toluidine blue O (TBO); x 400].

c. TEM of a β-cell of an normal rat showing numerous secretion granules. G, Golgi apparatus; M, mitochondria; N, nucleus; RER, rough endoplasmic reticulum; C, capillary. (x 15000);

d. TEM of a β-cell of normal rat showing numerous secretion granules (x 30000).

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**Fig-60**

a. Photomicrograph of an islet of diabetic rat showing pyknotic nuclei. Cellular boundary has been disrupted in the islet cells. I, islet of Langerhans, A, acinar tissue [Paraffin section, Hematoxylin & Eosin (H & E); x 400].

b. Semithin section of pancreas of diabetic rat showing an islet of Langerhans. The cell boundary between the islet cells is disrupted. I, islet of Langerhans; A, acinar tissue. [Toluidine blue O (TBO); x 400].

c. TEM of a β-cell of a diabetic rat showing numerous secretion granules, N, nucleus; M, mitochondria; G, Golgi apparatus; V, Vacuoles. (x 15000).

d. TEM of a β-cell of a diabetic rat showing numerous secretion granules (x 30000).
**Fig-61**

a. Photomicrograph of an islet of petroleum ether extract treated rat. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary. [Paraffin section, Hematoxylin & Eosin (H & E); x 400].

b. Semithin section of pancreas of petroleum ethane extract treated rat showing an islet of Langerhans. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary [Toluidine blue O (TBO); x 400].

c. TEM of a β-cell of petroleum ether extract treated rat showing numerous secretion granules. A, α-cell; B, β-cell; RER, rough endoplasmic.

d. TEM of a β-cell of petroleum ether extract treated rat showing numerous secretion granules (x 30000).

**Fig-62**

a. Photomicrograph of an islet of hexane extract treated rat. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary. [Paraffin section, Hematoxylin & Eosin (H & E); x 400].

b. Semithin section of pancreas of hexane extract treated rat showing an islet of Langerhans. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary [Toluidine blue O (TBO); x 400].

c. TEM of a β-cell of hexane extract treated rat showing numerous secretion granules. A, α-cell; B, β-cell; RER, rough endoplasmic.

d. TEM of a β-cell of hexane extract treated rat showing numerous secretion granules (x 30000).
**Fig-63**

a. Photomicrograph of an islet of ethyl acetate extract treated rat. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary.  [Paraffin section, Hematoxylin & Eosin (H & E); x 400].

b. Semithin section of pancreas of ethyl acetate extract treated rat showing an islet of Langerhans. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary  [Toluidine blue O (TBO); x 400].

c. TEM of a β-cell of ethyl acetate extract treated rat showing numerous secretion granules. A, α-cell; B, β-cell; RER, rough endoplasmic.

d. TEM of a β-cell of ethyl acetate extract treated rat showing numerous secretion granules (x 30000).

**Fig-64**

a. Photomicrograph of an islet of methanol extract treated rat. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary.  [Paraffin section, Hematoxylin & Eosin (H & E); x 400].

b. Semithin section of pancreas of methanol extract treated rat showing an islet of Langerhans. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary  [Toluidine blue O (TBO); x 400].

c. TEM of a β-cell of methanol extract treated rat showing numerous secretion granules. A, α-cell; B, β-cell; RER, rough endoplasmic.

d. TEM of a β-cell of methanol extract treated rat showing numerous secretion granules (x 30000).
Fig-65

a. Photomicrograph of an islet of aqueous extract treated rat. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary. [Paraffin section, Hematoxylin & Eosin (H & E); x 400].

b. Semithin section of pancreas of aqueous extract treated rat showing an islet of Langerhans. I, islet of Langerhans; A, acinar tissue; P, pyknotic nuclei; C, capillary [Toluidine blue O (TBO); x 400].

c. TEM of a β-cell of aqueous extract treated rat showing numerous secretion granules. A, α-cell; B, β-cell; RER, rough endoplasmic

d. TEM of a β-cell of aqueous extract treated rat showing numerous secretion granules (x 30000).

Fig-66

a. Photomicrograph of an islet of insulin treated rat showing pyknotic nuclei. Cellular boundary has been disrupted in the islet cells. I, islet of Langerhans, A, acinar tissue [Paraffin section, Hematoxylin & Eosin (H & E); x 400].

b. Semithin section of pancreas of insulin treated rat showing an islet of Langerhans. The cell boundary between the islet cells is disrupted. I, islet of Langerhans; A, acinar tissue. [Toluidine blue O (TBO); x 400].

c. TEM of a β-cell of an insulin treated rat showing numerous secretion granules, N, nucleus; M, mitochondria; G, Golgi apparatus; V, Vacuoles. (x 15000).

d. TEM of a β-cell of an insulin treated rat showing numerous secretion granules (x 30000).
Fig-67 a-3D Structure of Tyrosine Kinase (1IRK) retrieved from PDB; b-Prepared structure of Tyrosine Kinase(1IRK); c- Prepared 1IRK PDB structure using Discovery Studio 2.1. Active sites are identified and marked inside the red sphere; d-Close view of the active site in the red sphere

Fig-68 a-3D Structure of Thiazolidinedione retrieved from Pubchem; b-Prepared 3D structure of Thiazolidinedione retrieved from Pubchem; c-NMR Structure of lupeol; d- Prepared 3D structure of lupeol(the red colour indicates oxygen, white colour indicates hydrogen and ash colour indicates carbon)
Fig-69- Binding mode of TZD (Blue stick) within the active site of the 1IRK. Five hydrogen bonds of their interactions were presented in yellow dashed line with the bond length.

Fig-70- a-The docked result of lupeol with 1IRK (Totally 16 poses); b-The binding mode of lupeol with 1IRK (First pose-1irk in ribbon diagram, Lupeol bound on the active site which is in green color); c- Closed view of lupeol (white stick) with 1IRK (red stick) within the active site of the 1IRK. Two hydrogen bonds of their interactions were presented in green dashed line with the bond length; d- Total number of contacts between lupeol (white stick) and 1IRK (red stick) The interactions are shown in pink colour.
Fig. 58. a-Effect of lupeol on gastrocnemius muscle Glut-4 mRNA expression by One Step RT-PCR and Agarose Gel Electrophoresis in normal and Streptozotocin-induced diabetic male albino Wistar rats; b- Effect of lupeol on gastrocnemius muscle Glut-4 Protein expression by Western Blot Analysis in normal and Streptozotocin-induced diabetic male albino Wistar rats.
Fig. 71: Scanning Electron Micrograph of Chitosan-Alginate nanoparticles containing lupeol
Figure -72. FT-IR spectrum of sodium-alginate
Figure -73. FT-IR spectrum of chitosan
Figure 72. FT-IR spectrum of sodium-alginate
Figure 73. FT-IR spectrum of chitosan
Figure 74. FT-IR spectrum of lupeol
**Figure -75.** FT-IR spectrum of blank
Figure -76. FT-IR spectrum of lupeol loaded nanoparticle
Figure 74. FT-IR spectrum of lupeol
Figure -75. FT-IR spectrum of blank
Figure -76. FT-IR spectrum of lupeol loaded nanoparticle
# TABLE 2
Lipinski & ADMET properties of lupeol & thiazolindinedione

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<th>Compounds</th>
<th>Lupeol</th>
<th>Thiazolindinedione</th>
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<tr>
<td><strong>Description</strong></td>
<td>Lipinski Rule of Five</td>
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<tr>
<td>HAcce</td>
<td>1</td>
<td>5</td>
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<tr>
<td>Hdon</td>
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<td>1</td>
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<td>LogP</td>
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<td>Good absorption</td>
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### TABLE : 3
Drug Target Information

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<th>Target Name</th>
<th>Insulin Receptor</th>
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<tr>
<td><strong>Synonym</strong></td>
<td>CD_antigen=CD220</td>
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<tr>
<td><strong>Protein ID</strong></td>
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<tr>
<td><strong>Protein sequence Length:</strong></td>
<td>1382 AA</td>
</tr>
<tr>
<td><strong>Mol. Wt</strong></td>
<td>156,319(Da)</td>
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<tr>
<td><strong>Structure ID</strong></td>
<td>1IRK</td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td>This receptor binds insulin and has a tyrosine-protein kinase activity. Isoform short has a higher affinity for insulin. Mediates the metabolic functions of insulin. Binding to insulin stimulates association of the receptor with downstream mediators including IRS1 and phosphatidylinositol 3’-kinase (PI3K). Can activate PI3K either directly by binding to the p85 regulatory subunit, or indirectly via IRS1.</td>
</tr>
</tbody>
</table>
TABLE: 4
The receptor and ligand interaction details of thiazolidinedione

<table>
<thead>
<tr>
<th>Receptor/Decking details</th>
<th>1IRK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding site no.</td>
<td>1</td>
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<tr>
<td>Binding site Volume</td>
<td>X= 8.56 Å, Y= 68.78Å, Z= 18.84 Å, Radius=15 Å</td>
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<tr>
<td>Docking pose no</td>
<td>2</td>
</tr>
<tr>
<td>Docking pose energy</td>
<td>83.855</td>
</tr>
<tr>
<td>Site to which ligand has bound</td>
<td>Active site</td>
</tr>
</tbody>
</table>

**Receptor- ligand Hydrogen bonds**

<table>
<thead>
<tr>
<th>Amino acid</th>
<th>THR</th>
<th>ARG</th>
<th>ARG</th>
<th>ARG</th>
<th>GLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atom in amino acid</td>
<td>HN</td>
<td>HN</td>
<td>HE</td>
<td>HH21</td>
<td>O</td>
</tr>
<tr>
<td>Position</td>
<td>1154</td>
<td>1155</td>
<td>1155</td>
<td>1155</td>
<td>1152</td>
</tr>
<tr>
<td>Atom in Ligand</td>
<td>O5</td>
<td>O5</td>
<td>N7</td>
<td>O6</td>
<td>H35</td>
</tr>
<tr>
<td>Bond length</td>
<td>2.363000</td>
<td>2.437000</td>
<td>2.135000</td>
<td>1.985000</td>
<td>2.235000</td>
</tr>
<tr>
<td>Lib Docking scores</td>
<td>125.036</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No of Hotspots</td>
<td>&quot;16.06,64.88,12.14,A,25,31 14.06,64.88,13.94,A,39,32 14.86,64.48,11.54,A,20,33&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total No of hydrogen Bonds</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No of Contacts</td>
<td>24</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
### TABLE 5
The receptor and ligand interaction details of lupeol

<table>
<thead>
<tr>
<th>Receptor/Decking details</th>
<th>1IRK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding site no.</td>
<td>1</td>
</tr>
<tr>
<td>Binding site Volume</td>
<td>X= 10.5800,Y=70.6600,Z=10.8300 Radius = 10.00</td>
</tr>
<tr>
<td>Docking pose no</td>
<td>1</td>
</tr>
<tr>
<td>Docking pose energy</td>
<td>92.765</td>
</tr>
<tr>
<td>Site to which ligand has bound</td>
<td>Active site</td>
</tr>
</tbody>
</table>

#### Receptor- ligand Hydrogen bonds

<table>
<thead>
<tr>
<th>Amino acid</th>
<th>Ala</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Glu</td>
</tr>
<tr>
<td>Atom in amino acid</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>NH2</td>
</tr>
<tr>
<td>Position</td>
<td>1028</td>
</tr>
<tr>
<td></td>
<td>1077</td>
</tr>
<tr>
<td>Atom in Ligand</td>
<td>HB1</td>
</tr>
<tr>
<td></td>
<td>O31</td>
</tr>
<tr>
<td>Bond length</td>
<td>2.470</td>
</tr>
<tr>
<td></td>
<td>2.277</td>
</tr>
<tr>
<td>Li Docking scores</td>
<td>108.791</td>
</tr>
</tbody>
</table>

| No of Hotspots | "13.48,64.56,13.33,A,66,16
                | 6.48,70.16,14.13,A,72,29
                | 4.88,69.56,11.93,P,51,31" |

| Total No of hydrogen Bonds | 2 |
| No of Contacts             | 16 |