INTRODUCTION

Diabetes is characterized by chronic hyperglycaemia caused by defects in insulin secretion, insulin action, or both, resulting in impaired function in carbohydrate, lipid, and protein metabolism (Vlad and Popa, 2012). Generally, the injurious effects of hyperglycaemia are separated into macrovascular complications (coronary artery disease, peripheral arterial disease, and stroke) and microvascular complications (diabetic nephropathy, neuropathy, and retinopathy). Effective control of hyperglycaemia in diabetic patients is critical for reducing the risk of micro- and macrovascular complications (Khandouzi et al., 2015). Natural sources play an important role in the management of diabetes mellitus, especially in developing countries, delaying the development of diabetic complications and correcting the metabolic abnormalities (Al-Logmani and Zari, 2011). *Moringa oleifera* and *Hordeum vulgare* are among the natural sources reported to have beneficial effects in the treatment of many diseases.

Consumption of barley which contains many medicinally active phytocompounds is usually associated with improvement in health. Barley sprouts, which are the young leaves of barley harvested approximately 10 days after sowing the seeds, have recently received much attention as a functional food in numerous countries. The main constituents of barley include important antioxidants such as vitamin E, phytic acid, selenium, tocotrienols, and various phenolic acids. After the consumption of barley, these antioxidants are released at differential rate throughout the gastrointestinal tract over a long period of time. *Moringa oleifera* Lamarck (*Moringa*) is the cultivated species of the genus *Moringa* of the family Moringaceae. Several health benefits were reported as a result of supplementation with *Moringa leaves* (Mahajan et al., 2007; Hamza, 2010; Yassa and Tohamy, 2014). *Moringa* has also nutraceutical uses and is used in treatment of hypercholesterolemia and hyperglycaemia, and also, as a nutritional supplementation, it can be prescribed as food appendage for coronary artery disease patients along with their regular medicines. (Rajanandh et al., 2012)

MATERIALS AND METHODS

*Moringa oleifera* leaves were collected from the campus of college and dried the leaves in 60°C oven. *Hordeum vulgare* were cultivated and the grass only harvested after 14th day and dried.
in oven and powdered for the extraction. Both dried powder sample were extracted by methanol extraction and evaporated with rotary evaporator

**Preliminary Phytochemical Screening**

Preliminary phytochemical screening was done for the presence of carbohydrates, proteins, saponins, alkaloids, flavonoids, tannins, tri-terpenoids and phenolic compounds according to the procedure described in “Textbook of Practical Pharmacognosy” by C.K. KOKATE

**Microvascular Complication Diabetic nephropathy**

**Animals**

Thirty Six Wister rats weighing 90-220gm were obtained from Dubai college animal house. All the animals were weighed and grouped into 5 groups(n=4) and kept under light-dark cycle and given drinking water ad libitum. All grouped animal were administration daily through oral route of methaonal extract of test sample until experiment period. Group 1 as control received normal saline; group 2 Moringa oleifera 50mg/kg, group 3 Hordeum vulgare 50mg/kg and group 4 &5 their mixture 1:1 (Moringa oleifera Hordeumvulgare) 50&100mg/kg

**Diabeticnephropathy in rat**

Models of STZ-induced diabeticnephropathy injected once into the tail vein with STZ 60mg/kg in sodium citrate buffer (1ml/kg). (Al-Malki, 2013) Following the STZ injection, rats should be given drinking water supplemented with sucrose (15 g/L) for 48 h, to limit early mortality as stores of insulin are released from damaged pancreatic islets., rats should be assessed for hyperglycaemia and those with fasting blood glucose of over 15 mmol/L (280 mg/dL), should be included in studies of diabetic nephropathy. To prevent subsequent development of ketonuria, diabetic rats should be given daily subcutaneous injections of long-acting insulin (2–4 U/rat) to maintain blood glucose levels in a desirable range (16–33 mmol/L, 300–600 mg/dL)

**Blood Glucose Monitoring**

Blood glucose levels were determined pretest and weekly. Hyperglycemia was evident by 2-3 weeks. Control glucose was in the 153 mg/dl±16 range and STZ-treated glucose levels were consistently in the 765±98 mg/dl range from Week 1-4.

**Collection of blood samples and biochemical analysis from serum**

At the end of the experiments on the 30th day, blood samples were collected 20 h from fasting using light ether anesthesia from retro orbital sinus puncture

Biochemical assessment of renal injury

Urine albumin excretion is considered to be one of the most sensitive markers of renal injury. Measurements of UAER normally require rodents to be maintained in metabolic cages for 24 h to collect urine. The albumin: creatinine ratio in urine can also be used to measure diabetic renal injury in rodents. Blood sample for estimation of creatinine, blood urea nitrogen, uric acid and total protein.

**Statistical Analysis**

Statistical analysis was performed as the mean± standard deviation (SD). The results were analyzed for statistical significance by unpaired t-test followed by Dunnet “sposthoc test of significance. P value less than 0.05 were considered as statistically significant.

**RESULTS AND DISCUSSION**

Effect of Moringa oleifera, Hordeumvulgare and their mixture on Serum level

The mean values of urea, creatinine, and uric acid in the serum of the positive control group (G1) were significantly (P < 0.001) increased as a result of induced diabetes shown in Table 3. Treating these diabetic rats with methanolic extracts of Moringa oleifera, Hordeumvulgare and their mixture in G2, G3, G4 and G5, respectively G3&G5 significantly (P < 0.001) decreased urea, creatinine, and uric acid levels compared with those of the positive control group (G1). The mixture G5 of their both methanolic extract of Moringa oleifera and Hordeumvulgare were more effective than that of alone G2&G3. Also, Table 1 shows that the mean values of urinary albumin of the control group were significantly (P < 0.001) increased compared to other groups. Treatment the diabetic nephropathy rats in G2, G3, G4 and G5 with methanolic extract of Moringa oleifera and Hordeumvulgare and their mixture , respectively, significantly (P < 0.001) decreased urinary albumin and increased creatinine in urine when compared with those of the control (G1).

**Histopathological studies of Kidney tissue**

Microscopically, the histopathological examination of the kidney tissues of rats in the group control (Figure 1(a)), which

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**Table 1. Effect of treating diabetic nephropathy rats with methanolic extracts of Moringa oleifera, Hordeumvulgare and their mixture for 4 weeks on kidney functions and urine**

<table>
<thead>
<tr>
<th>Group</th>
<th>Creatinine mg/dl</th>
<th>Blood Urea Nitrogen mg/dl</th>
<th>Total Protein g/dl</th>
<th>Blood Glucose mg/dl</th>
<th>Urine albumin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>2.17±1.28</td>
<td>63.10±3.10</td>
<td>12.30±1.42</td>
<td>258±3.96</td>
<td>32.44±0.13</td>
</tr>
<tr>
<td>Moringa oleifera 50mg/kg</td>
<td>0.75±1.71</td>
<td>45.58±0.13</td>
<td>8.14±3.96</td>
<td>100.8±5.20</td>
<td>21.32±0.12</td>
</tr>
<tr>
<td>Hordeumvulgare 50mg/kg</td>
<td>0.95±1.89</td>
<td>50.01±1.96</td>
<td>7.61±1.26</td>
<td>94.48±3.36</td>
<td>17.27±0.01</td>
</tr>
<tr>
<td>Mixture (Moringa oleifera &amp; Hordeumvulgare) 50mg/kg</td>
<td>0.87±2.32</td>
<td>40.12±0.03</td>
<td>7.84±2.05</td>
<td>132±2.27</td>
<td>21.29±0.21</td>
</tr>
<tr>
<td>Mixture (Moringa oleifera &amp; Hordeumvulgare) 1000mg/kg</td>
<td>0.42±2.32</td>
<td>21.82±1.03</td>
<td>5.62±2.05</td>
<td>72.2±4.07</td>
<td>15.31±0.31</td>
</tr>
</tbody>
</table>

Values are represented as mean ±SD, where n=6. ***P<0.001 as compare to normal control, **p<0.01 as compare to control. ANOVA analysis: within each row, means with different superscript.
showed a collapsed glomerular tuft with marked tubular atrophy associated with interstitial inflammation and interstitial hemorrhage (Figure 1(b), (c), (d) & (e)). Meanwhile, the kidney sections of diabetic rats in G3 treated with the *Moringa oleifera, Hordeum vulgare* and their mixture of methanol extract for 4 weeks seemed to be restoring the normal appearance of glomeruli and regenerated tubules with interstitial hemorrhage and the kidney nearly restored the normal cortical tissue shown on (Figure 1(c) & (e)).

**Conclusion**

Diabetes mellitus is metabolic disorder leading to hyperglycemia, which later develops to micro- and macrovascular complications. The induction of experimental diabetes in the rats using chemicals which selectively destroy pancreatic β-cells is very convenient and simple to use as streptozotocin (STZ) that acts as diabetogenic agent mediated by reactive oxygen species. In the present study, induction of diabetes using streptozotocin (STZ) at a dose of 60mg/kg in rats of the control group showed significant increase in serum glucose level compared with the control group. The concurrent administration of *Moringa oleifera, Hordeum vulgare* and their mixture of methanol extract to the diabetic nephropathy rats G3, G3 and G4, respectively, for 4 weeks significantly decreased glucose levels most probably due to their antioxidant enzymes in diabetic kidney, which is considered a major complication of diabetes. The mixture of *Moringa oleifera, Hordeum vulgare* methanolic extract group 5 shows highly significant effect in blood serum level to decrease the creatinine, urea and total protein level compared to control group.

**REFERENCE**


