The reducing power of the methanol extract was linearly proportional to the concentration of the sample. Ascorbic acid was taken as reference standard. The result of phytochemical analysis was recorded in Table 1. Both the stem and root extracts of *P. viscida* exhibited potential antioxidant activity in the both the assay models (Tables 2 and 3). The methanol extracts from stem and root of *P. viscida* showed potent antioxidant activity based on the DPPH and reducing power tests in dose dependent manner. The stem and root extracts strongly scavenged DPPH radicals with the IC\textsubscript{50} being 31.01±0.091 and 23.78±0.098 µg/ml, respectively. It also caused significant elevation of reducing power. The higher absorbancy at high concentration indicates the strong reducing power potential. The presence of phenolic compounds might be responsible for the antioxidant activity.

**ACKNOWLEDGEMENTS**

The authors express their sincere gratitude to the management of Karpagam Arts and Science College, Coimbatore.

**REFERENCES**


---

**TABLE 2: FREE RADICAL SCAVENGING ACTIVITY OF P. VISCIDA BY DPPH RADICAL INHIBITION**

<table>
<thead>
<tr>
<th>Concentration (µg/ml)</th>
<th>Stem IC\textsubscript{50} (µg/ml) Mean±Std\textsuperscript{a}</th>
<th>Root IC\textsubscript{50} (µg/ml) Mean±Std\textsuperscript{a}</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>94.54±0.432</td>
<td>86.20±0.094</td>
</tr>
<tr>
<td>500</td>
<td>94.1±0.163</td>
<td>85.13±0.817</td>
</tr>
<tr>
<td>250</td>
<td>75.03±0.368</td>
<td>82.8±0.496</td>
</tr>
<tr>
<td>125</td>
<td>68.63±1.59</td>
<td>69.76±0.786</td>
</tr>
<tr>
<td>50</td>
<td>56.9±0.409</td>
<td>59.2±0.432</td>
</tr>
<tr>
<td>25</td>
<td>48.36±0.459</td>
<td>51.32±0.093</td>
</tr>
<tr>
<td>10</td>
<td>40.32±0.356</td>
<td>41.65±0.612</td>
</tr>
<tr>
<td></td>
<td>Ascorbic acid (IC\textsubscript{50})</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.24±0.022</td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{a}denotes Mean ±Std at 95% Confidence Interval

**TABLE 3: REDUCING POWER ACTIVITY OF P. VISCIDA**

<table>
<thead>
<tr>
<th>Concentration (µg/ml)</th>
<th>Absorbance at 700 nm inhibition (Mean±Std\textsuperscript{a})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stem</td>
</tr>
<tr>
<td>1000</td>
<td>0.929±0.0301</td>
</tr>
<tr>
<td>500</td>
<td>0.571±0.0443</td>
</tr>
<tr>
<td>250</td>
<td>0.382±0.0946</td>
</tr>
<tr>
<td>125</td>
<td>0.388±0.0602</td>
</tr>
<tr>
<td>Control</td>
<td>0.094±0.001</td>
</tr>
<tr>
<td>Ascorbic acid [1000 (µg/ml)]</td>
<td>1.634±0.045</td>
</tr>
</tbody>
</table>

\textsuperscript{a}denotes Means ±Std at 95% Confidence Interval

---

**Effect of Cyclosporine on Weight and Crown-rump Length of Mice Embryo**

M. R. NAMAVAR* AND S. BAHMANPOUR
Department of Anatomical Sciences, School of Medicine, Shiraz University of Medical Sciences, Shiraz - 71348-53185, Iran.

\*For correspondence
E-mail: namavarm@sums.ac.ir

---

582 Indian Journal of Pharmaceutical Sciences July - August 2007
Cyclosporine A is an immunosuppressive agent, which is widely used for organ transplantation, autoimmune and other diseases. Cyclosporine inhibits the calcineurin and thereby causes inhibition of chondrogenesis. Cyclosporine crosses the placenta and reaches to the embryo, and thereby may affect them. Many females, that should receive cyclosporine, are in childbearing age. The objective of this study was to determine whether cyclosporine administration has any effect on weight and crown-rump length of mouse embryos. Many out bred adult mice were selected. Female mice were mated overnight with males, checked in the morning for vaginal plug. Pregnant mice were randomly assigned into experimental and control groups. The experimental group received cyclosporine and control group received an equivalent amount of olive oil on days 7, 8, and 9 of gestation. Pregnant mice were killed and embryos were removed on days 13, 16, and 18 of gestation. The weight and crown-rump length of embryos were recorded. Comparison between two groups was made using t-test. There were highly significant differences between crown-rump length of experimental and control groups on days 16 and 18 (P < 0.05), but on day 13, crown-rump length difference was not significant. In all ages of gestation, the experimental group had less weight than the control group (P < 0.05). Results of this study indicate that cyclosporine causes low weight and low crown-rump length in mice embryos.

Key words: Cyclosporine, weight, crown-rump length, pregnancy, mouse embryo

Cyclosporine A (CsA) is a selective and powerful immunosuppressive agent which is widely used for organ transplantation, autoimmune and other diseases. CsA inhibits the activation of calcineurin and thereby causes inhibition of chondrogenesis. CsA crosses the placenta blood barrier reaches to the embryo. Many female patients that should receive CsA, are in childbearing age. The objective of this study was to determine whether CsA exposure in uterus is associated with low weight and low CRL of embryos. Many out bred adult mice (male and female) were kept in a standard condition in separate cages for one month. Female mice (50) were mated overnight with males, checked in the morning for vaginal plugs. The first day of gestation was considered to the day after plug was found. CsA was dissolved in olive oil at concentration of 15 mg/ml. Two groups of pregnant mice were randomly selected and were assigned into experimental and control groups. The experimental group received an intraperitoneal injection of CsA at dosage of 50 mg/kg/day of body weight and control group received an equivalent amount of olive oil on days 7, 8, and 9 of gestation.

First, the mice were anesthetized with ether inhalation and then killed by cervical dislocation on days 13, 16, and 18 of gestation. The uterus and its contents were exposed by laparotomy. The weight and CRL of embryos were recorded. A comparison between two groups was made using Student’s t test. Comparisons resulting in P < 0.05 were considered significant.

There were 235 embryos in the experimental group and 95 in the control group. The number of embryos decreased in CsA treated group and there were 120 embryo absorption sites in experimental group. In all ages of gestation, the experimental group had less CRL than the control group (fig. 1), but on day 13, there was not significant difference between experimental and control groups. On days 16 and 18, there were highly significant differences between experimental and control groups (P < 0.05). The ratio of CRL in experimental to control group was 0.97, 0.89, and 0.85 on days 13, 16, and 18 of gestation, respectively. Therefore, CsA effect on CRL was higher...
in the last days of pregnancy than earlier days.

Fig. 2 illustrates the comparison of CsA effect on the weight of embryos. In all ages of gestation, the experimental group embryos had less weight than the control group and there were highly significant differences between experimental and control groups ($P < 0.05$). The ratio of weight in experimental to control group was 0.56, 0.72, and 0.85 on days 13, 16, and 18 of gestation, respectively. Thus, CsA effect on weight was higher in the early days of gestation than last days. As shown in figs. 1 and 2, these results revealed that the mice treated with CsA had a significantly higher frequency of low weight and low CRL than the mice treated with olive oil alone.

According to our data, CsA decreases CRL and weight of embryos. It supports the findings of other studies related to CsA effect on pregnancy outcomes.

Several reports have shown that children born by mothers who had taken CsA often present with the low birth weight (LBW), intrauterine growth retardation or small for gestation age. Rahbar and Forghani reported that 77% of newborns, whose mothers used CsA, had LBW. There are similar reports about LBW in infants whose mothers used CsA alone or with combination to other drugs. For example, LBW percentage reported by Lamarque et al. was 44.3%, Armenti et al. 44-65%, Janssen and Genta 50%, and Moon et al. 63.5%. Moon et al. have reported that LBW of neonates was related to their mother’s hypertension. They compared infants of hypertensive and non-hypertensive mothers, although there was LBW in infants whose mothers did not have hypertension but received CsA.

The dosage used in this study considerably exceeds what is normally given to transplant recipients and other patients, although some patients have been given as much as 25 mg/kg/day or also 30 mg/kg/day in rats and 100 mg/kg/day in rabbits. Gasser et al. also used 50 mg/kg/day in mice for teratogenicity. The results of this study indicate that CsA causes low weight and low CRL in mice embryos, as compared with those published in the recent literature with CsA. CsA mostly decreased the weight and CRL of mouse embryos in the earlier and last days of pregnancy, respectively. It is recommended that the drug should not be taken during pregnancy, unless the benefit to the patient outweighs the risk for the fetus.
more research should be done on the subject.

AKNOWLEDGEMENTS

The support provided by the Vice-Chancellor for Research of Shiraz University of Medical Sciences is gratefully acknowledged. We wish to thank the personnel at animal house in Shiraz Medical School.

REFERENCES