Short Communication

ERYTHROPOIETIC EFFECTS OF SOME MEDICINAL PLANTS OF INDIA ON EXPERIMENTAL RAT MODEL

P. S. LOHAR1*, M. S. LOHAR2, S. ROYCHOUDHURY3

1Department of Zoology, MGSM’s Arts, Science and Commerce College, Maharashtra, India;
2Department of Biotechnology, M. J. College, Maharashtra, India;
3Slovak University of Agriculture, Slovak Republic

ABSTRACT

Various chemical constituents of plants are believed to possess anti-inflammatory and antioxidant properties. However, their erythropoietic effects on test animals remain unclear. The present study aimed at investigating the erythropoietic activities of some medicinal plants found in India: Aegel marmelos, Asparagus recemosus, Boerhavia diffusa, Carissa congesta, Eugenia jambolana, Ficus carica, Phoenix sylvestris, Phyllanthus emblica, Spinaca oleracean, and Vitis vinifera on Wistar albino rats. Fruit, leaf and root extracts of these plants were prepared and fed to experimental rat model for seven consecutive days to evaluate their effects on the haematological parameters such as red blood cells count (RBC count) and haemoglobin (Hb%). The RBC count (the highest of 4.96±0.08 for fruit extract Phyllanthus emblica vs. 3.96±0.03 for control) and Hb% (the highest of 13.44±0.18 for fruit extract Phyllanthus emblica vs. 10.74±0.12 for control) in the test animals showed augmentation as compared to the controlled group of rats. Rats fed with fruit extracts of Aegel marmelos, Carissa congesta, Eugenia jambolana, Ficus carica, Phoenix sylvestris, Phyllanthus emblica, and Vitis vinifera separately showed increase in their haematological parameters. Obtained results indicate that most of the plant extracts boost synthesis of haemoglobin and formation of RBCs in the descending order: Phyllanthus emblica, Spinaca oleracean L, Ficus carica L, Phoenix sylvestris L, Boerhavia diffusa L, Aegel marmelos L, Vitis vinifera L, Eugenia jambolana Lam, Asparagus recemosus, and Carissa congesta.

Key words: Erythropoiesis, Medicinal plants, RBC count, Hb%, Wistar albino rats, Phyllanthus emblica, Spinaca oleracean L, Ficus carica L, Phoenix sylvestris L, Boerhavia diffusa L, Aegel marmelos L, Vitis vinifera L, Eugenia jambolana Lam, Asparagus recemosus, Carissa congesta

INTRODUCTION

Blood cells are constantly formed inside the body through a process called haemopoiesis, and erythropoiesis refers to the formation of erythrocytes. This process occurs in myeloid tissue present in the red bone marrow of the humerus, femor, ribs, sternum, pelvis, and portions of the skull. Erythropoiesis is an extremely active process that requires several metabolites for synthesis of haemoglobin, which contains globin as protein part and haem as prosthetic group. Various chemical constituents were reported form plants selected for the study having anti-inflammatory and antioxidant activities but there is scarcity of study related to their erythropoietic effect on test animals.

Emblica officinalis Gaertn. (locally known as amla and commonly referred as Indian gooseberry), Spinaca oleracean L., Eugenia jambolana Lam. (locally called as jambhul) Aegel marmelos, Ficus carica L., Carissa congesta Wt., Phoenix sylvestris L., Boerhavia diffusa L, Asparagus recemosus are abundantly found in the forest of Satpuda ranges of North Maharashatra, India. The plants selected for the present study with their respective families, local names and the part used is...
Table 1: Medicinal plants with their families, local names and plant part used to study erythropoietic effect on experimental rat model

<table>
<thead>
<tr>
<th>Botanical name (Family)</th>
<th>Local name</th>
<th>Plant part used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aegel marmelos (Rutaceae)</td>
<td>Bel</td>
<td>Fruit</td>
</tr>
<tr>
<td>Carissa congesta (Apocynaceae)</td>
<td>Karwand</td>
<td>Fruit</td>
</tr>
<tr>
<td>Eugenia jambolana (Myrtaceae)</td>
<td>Jambul</td>
<td>Fruit</td>
</tr>
<tr>
<td>Ficus carica (Moraceae)</td>
<td>Anjir</td>
<td>Fruit</td>
</tr>
<tr>
<td>Phoenix sylvestris (Palmae)</td>
<td>Khajur</td>
<td>Fruit</td>
</tr>
<tr>
<td>Phyllanthus emblica (Euphorbiaceae)</td>
<td>Awala</td>
<td>Fruit</td>
</tr>
<tr>
<td>Vitis vinifera (Vitaceae)</td>
<td>Angoor</td>
<td>Fruit</td>
</tr>
<tr>
<td>Boerhavia diffusa (Nyctaginaceae)</td>
<td>Punarnava</td>
<td>Leaf</td>
</tr>
<tr>
<td>Spinaca oleracean (Chenopodiaceae)</td>
<td>Palak</td>
<td>Leaf</td>
</tr>
<tr>
<td>Asparagus recemosus (Liliaceae)</td>
<td>Shatawari</td>
<td>Root</td>
</tr>
</tbody>
</table>

given in table 1. These plants have important place in Indian herbal medicine and in every tropical country where they grow. Vitis vinifera L. is locally identified as grapes belonging to family Vitaceae abundantly cultivated in Nasik district of Maharashtra. The plants selected in the present study are also reported from other parts of the Indian sub-continent and are traditionally used in preparations of herbal medicines. Phyllanthus emblica is used in preparations of astringent tonic and antiseptic creams (Sivarajan and Balachandran, 1994). The phytochemicals such as carotenoids, saponin, glycosides and antioxidants were isolated by Rani et al (1999) studied antioxidant activity of active tannoid principle of Emblica officinalis. Gopan et al (2007) obtained essential oil from Eugenia sp. and the oil was characterized by predominance of monoterpenes, limonene, alpha-humulene, beta-caryophyllene, and linalool that displayed antibacterial activity. Vitis vinifera L. is widely used in making of vinegar, wine and other good quality alcoholic beverages. It prevents general weakness, thirst and burning sensation. Dried fruits of Vitis vinifera L. have been used to prevent constipation, cough, urinary tract inflammation, headache, liver disorders, bilicosness, debility, hoarseness, eye disease, and bleeding piles (Murthy and Pandey, 1983).

In view of the above mentioned considerations, the present study, attempts to investigate the erythropoietic activities of Aegel marmelos, Asparagus recemosus, Boerhavia diffusa, Carissa congesta, Eugenia jambolana, Ficus carica, Phoenix sylvestris, Phyllanthus emblica, Spinaca oleracean, and Vitis vinifera on Wistar albino rats.

MATERIALS AND METHODS

Identification, collection and authentication of plants and preparation of fruit/leaf/root extracts

Phyllanthus emblica, Eugenia jambolana Lam., Aegel marmelos L., Carissa congesta Wt., Boerhavia diffusa L., Asparagus recemosus are grown in a farm land located in the vicinity of Chopda city on the Burhanpur-Ankaleshwar road for commercial purpose. Vitis vinifera L. and Spinaca oleracean L. are cultivated every year in the same farm land. Ficus carica and Phoenix sylvestris were located in collected from Satpuda forest. The plants were identified and authenticated by Ayurvedacharya Dr. Vikas Gulave, Bhusawal (District Jalgaon, MS, India) during his local visit. The fresh fruits of Phyllanthus emblica, Eugenia jambolana Lam., Aegel marmelos L., Carissa congesta Wt., Vitis vinifera L., Ficus carica, Phoenix sylvestris leaves of Spinaca oleracean L. and roots of Asparagus recemosus were collected in the last year season (August to October, 2007) and brought to the laboratory. Fruits were washed and the pulp extracts (without seeds) were prepared in separate sterile containers. The fruit juices of each plant were then filtered, sterilized and preserved. Aqueous leaf extract of Spinaca oleracean L. and Boerhavia diffusa L. were prepared in separate sterilized containers. The roots of Asparagus recemosus were processed to prepare 95% ethanolic extract.

Animal Model

Adult rats (Wistar albino strain, weight 125-150 g) of either sex were purchased from Raj Udyog, Pune, MS, India. The animals were acclimatized in the laboratory for two weeks before the start of experimentation. They were fed on standard diet and water ad libitum.

Apparatus and Reagents

Neubauer’s double hemocytometer and Sahli’s haemoglobinometer of German make were used for counting total red blood corpuscles and to estimate percentage of haemoglobin respectively in blood samples of controlled and test rats. All solvents and chemicals used in experimentation were of analytical grade purchased from Glaxo, Mumbai, MS, India.

Grouping of experimental animals to evaluate the effect of fruit juice

Wistar albino rats of mixed population were
divided into 11 groups of six rats in each group. Seven test groups were fed orally with fruit extract of Aegel marmelos, Carissa congesta, Eugenia jambolana, Ficus carica, Phoenix sylvestris, Phyllanthus emblica, and Vitis vinifera separately at a dose of 50 mg/kg body weight/day for seven consecutive days. Two groups of six test rats were fed orally with aqueous leaf extracts of Boerhavia diffusa and Spinaca oleracean separately at a dose of 50 mg/kg body weight/day for seven consecutive days. Another group of six test rats were fed orally with 95% ethanolic root extract of Asparagus recemosus at a dose of 50 mg/kg body weight/day for seven consecutive days. A group of six untreated rats were taken as control.

**RBC Count and Hb Estimation**

On seventh day blood samples were collected from all rats through retro orbital puncture for counting total number of red blood corpuscles (RBCs) and estimation of haemoglobin (Hb). In each blood sample, RBC count and Hb percentage were estimated using Neubauer’s double hemocytometer and Sahli’s haemoglobinometer, respectively.

**Statistical Analysis**

Entire experimental set was repeated twice and results are expressed as means ± S.D. Statistical analysis was done by student’s ‘t’ test. Comparison between different groups was done by one way ANOVA using graph pad in stat software, USA, Key plot.

**RESULT AND DISCUSSION**

Screening of 10 medicinal plants for their erythropoietic effects on the experimental rats of Wistar strain in the present study lead to the data that were statistically processed and the results are given in table 2. The haematological parameters mainly RBC count and Hb% in the test animals showed augmentation as compared to the controlled group of rats. Rats fed with fruit extracts of Aegel marmelos, Carissa congesta, Eugenia jambolana, Ficus carica, Phoenix sylvestris, Phyllanthus emblica, and Vitis vinifera separately showed increase in their haematological parameters. Similarly, two groups of test rats fed orally with aqueous leaf extracts of Boerhavia diffusa and Spinaca oleracean separately also shown increasing trend in their RBC count and Hb%. In addition, a group of test rats fed orally with 95% ethanolic root extract of Asparagus recemosus also shown the same pattern in their hematological parameters on the seventh day of treatment. There were statistically significant results so far the erythropoietic effects of Phyllanthus emblica, Spinaca oleracean, Ficus carica, Phoenix sylvestris, Boerhavia diffusa, Aegel marmelos, and Vitis vinifera on test animals were concerned while the plants Eugenia jambolana, Ficus carica, and Aegel marmelos Wt. did not show any significant increase in RBC count and Hb% in test animals (Sarswathi et al., 2007). On the basis of results obtained in the present study, the plants can be arranged in the following descending order for their erythropoietic

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Plant</th>
<th>Haematological parameters (x 10^6/cu mm)</th>
<th>Hb%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control (untreated)</td>
<td>3.96±0.03</td>
<td>10.74±0.12</td>
</tr>
<tr>
<td>2</td>
<td>Aegel marmelos (fruit extract)</td>
<td>4.38±0.04 (10.6)</td>
<td>11.78±0.14  (9.68)</td>
</tr>
<tr>
<td>3</td>
<td>Carissa congesta (fruit extract)</td>
<td>3.98±0.05 (0.52)*</td>
<td>11.14±0.17  (3.72)*</td>
</tr>
<tr>
<td>4</td>
<td>Eugenia jambolana (fruit extract)</td>
<td>4.08±0.07 (3.03)*</td>
<td>11.21±0.10  (4.37)*</td>
</tr>
<tr>
<td>5</td>
<td>Ficus carica (fruit extract)</td>
<td>4.66±0.05 (17.68)</td>
<td>12.71±0.11  (18.34)</td>
</tr>
<tr>
<td>6</td>
<td>Phoenix sylvestris (fruit extract)</td>
<td>4.49±0.03 (13.38)</td>
<td>12.29±0.13  (14.43)</td>
</tr>
<tr>
<td>7</td>
<td>Phyllanthus emblica (fruit extract)</td>
<td>4.96±0.08 (25.25)</td>
<td>13.44±0.18  (22.34)</td>
</tr>
<tr>
<td>8</td>
<td>Vitis vinifera (fruit extract)</td>
<td>4.30±0.04 (8.58)</td>
<td>11.54±0.09  (7.48)</td>
</tr>
<tr>
<td>9</td>
<td>Boerhavia diffusa (aqueous leaf extract)</td>
<td>4.41±0.05 (11.36)</td>
<td>12.07±0.14  (12.38)</td>
</tr>
<tr>
<td>10</td>
<td>Spinaca oleracean (aqueous leaf extract)</td>
<td>4.74±0.05 (19.7)</td>
<td>12.93±0.09  (20.39)</td>
</tr>
<tr>
<td>11</td>
<td>Asparagus recemosus (ethanolic root extract)</td>
<td>4.02±0.04 (1.51)*</td>
<td>11.06±0.13  (2.97)*</td>
</tr>
</tbody>
</table>

Values are represented as mean ± SD of six observations in each experimental set. Values in parentheses are percentage changes over control. Changes over control are significant at p< 0.05.

* Non significant
activity on the test animals such as *Phyllanthus* emblica, *Spinaca oleracea* L., *Ficus carica* L., *Phoenix sylvestris* L., *Boerhavia diffusa* L., *Aegel marmelos* L., *Vitis vinifera* L., *Eugenia jambolana* Lam., *Asparagus recemosus*, and *Carissa congesta*. Since the plants selected in the present study showed increase in haematological parameters of test animals indicating their boosting effects on the synthesis of haemoglobin and formation of red blood corpuscles due to their richness in iron and vitamin C hence these plants might have a promising role in the treatment and/or prevention of anaemia.

**REFERENCES**


The scientific journal Slovak Journal of Animal Science publishes original papers, review articles, short communications, reviews of important works, chronicles, and reports on participation in important international conferences. Topics of the journal include problems in biology of animals, animal production and veterinary medicine.

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