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Short Communication

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

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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 erythropioetic 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. The 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 Maharashtra, India. The plants selected for the present study with their respective families, local names and the part used is

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Table 1: Medicinal plants with their families, local names and plant part used to study erythropoietic effect on experimental rat model

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

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* (2004) and Sharma *et al* (2007). *Eugenia jambolana* Lam. is noted for its astringent and antisialagogues properties. The fruits of *Eugenia jambolana* are used in treatment of dysentery, spleen disorders, indigestion, diabetes mellitus, and acne (Chopra *et al*, 1956). Bhattacharya *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 erythropioetic 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. Similary, 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 heamtological parameters on the seventh day of treatment. There were statistically significant results so far the erythropioetic effects of *Phyllanthus* emblica*, Spinaca oleracean* L*, Ficus carica* L.*, Phoenix sylvestris* L.*, Boerhavia diffusa* L*, Aegel marmelos* L. and *Vitis vinifera* L. on test animals were concerned while the plants *Eugenia jambolana* Lam*, Asparagus recemosus, Carissa congesta* 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 erythropioetic

Table 2: Effect of selected plant extract on RBC count and Hb% of experimental rat

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

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 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.* 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.

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