

Evaluation of Anti-Anemic Activity of Ethanolic Extract of *Spirulina Platensis* in Experimental Rats

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Abstract

Iron deficiency is the leading cause of anemia and is associated with fatigue, impaired immunity, poor cognitive function, and reduced quality of life. Although conventional iron supplements are effective, they frequently produce gastrointestinal adverse effects, limiting patient compliance. Therefore, there is increasing interest in natural products with hematinic potential.

The present study aims to evaluate the anti-anemic activity of the ethanolic extract of *Spirulina platensis* using an experimentally induced anemia model in Wistar rats. Anemia will be induced using phenylhydrazine hydrochloride. Animals will be treated with different doses of ethanolic extract and compared with a standard hematinic preparation. Hemoglobin concentration, RBC count, hematocrit, serum iron, ferritin, total iron-binding capacity, and histopathological changes of the spleen and liver will be evaluated.

The study is expected to demonstrate that the ethanolic extract of *Spirulina platensis* significantly improves hematological parameters owing to its iron content, antioxidant activity, and nutritional composition.

Keywords: *Spirulina platensis*, anemia, hemoglobin, erythropoiesis, phenylhydrazine, rats, antioxidant.

Introduction

Medicinal plants have been used since ancient times as a source of therapeutic agents for various ailments. Phenylhydrazine-induced anemia, frequently employed in experimental pharmacology, is an example of chemically induced hemolytic anemia. Phenylhydrazine generates reactive oxygen species that oxidize hemoglobin and membrane proteins, leading to erythrocyte destruction. *Spirulina platensis* is considered a rich natural source of bioavailable iron. In addition to iron, it contains proteins, chlorophyll, phycocyanin, vitamins (B-complex, E), β -carotene, and essential amino acids that collectively support erythropoiesis. Phycocyanin possesses antioxidant properties that help protect erythrocytes from oxidative injury, while chlorophyll has structural similarities to heme and has been suggested to support hematopoietic processes.

Material and Methods

The present study was designed to evaluate the anti-anemic activity of the ethanolic extract of *Spirulina*

platensis using a phenylhydrazine-induced hemolytic anemia model in Wistar rats. The study included extraction of the test material, phytochemical evaluation, acute oral toxicity assessment, induction of anemia, treatment with the extract and standard drug, followed by hematological, biochemical, antioxidant, and histopathological investigations.

Plant Material

Dried biomass of *Spirulina platensis* was procured from an authenticated commercial supplier/research institute.

Chemicals and Reagents

The chemicals used in the present investigation were of analytical reagent (AR) grade.

Experimental Animals

Healthy adult Wistar albino rats of either sex weighing **180–220 g** were used.

The animals were obtained from a CPCSEA-registered animal house of Chameli Devi Institute of Pharmacy, Indore. The experimental protocol was approved by the **Institutional Animal Ethics Committee (IAEC)** constituted under CPCSEA, Government of India.

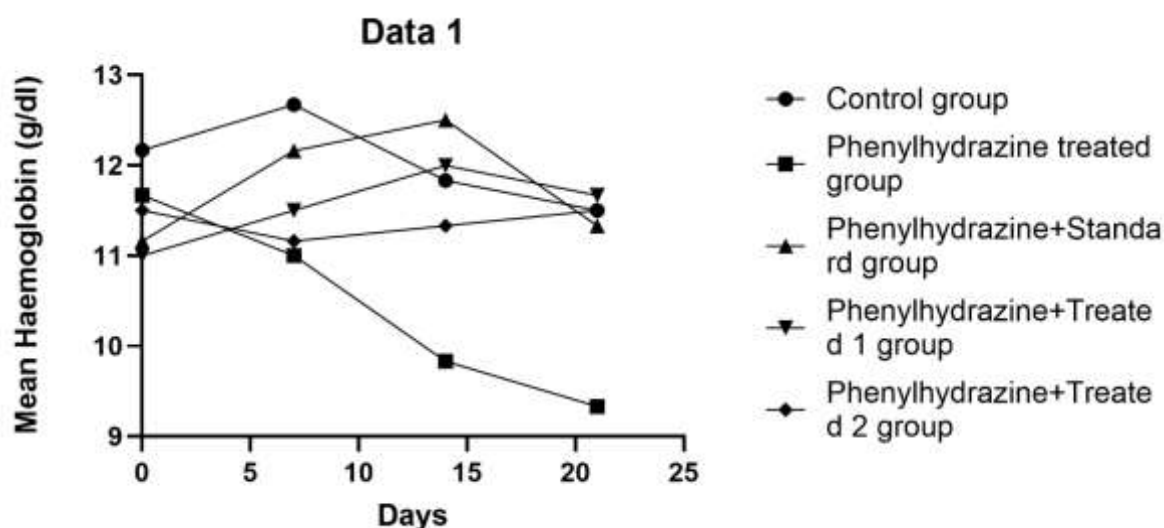
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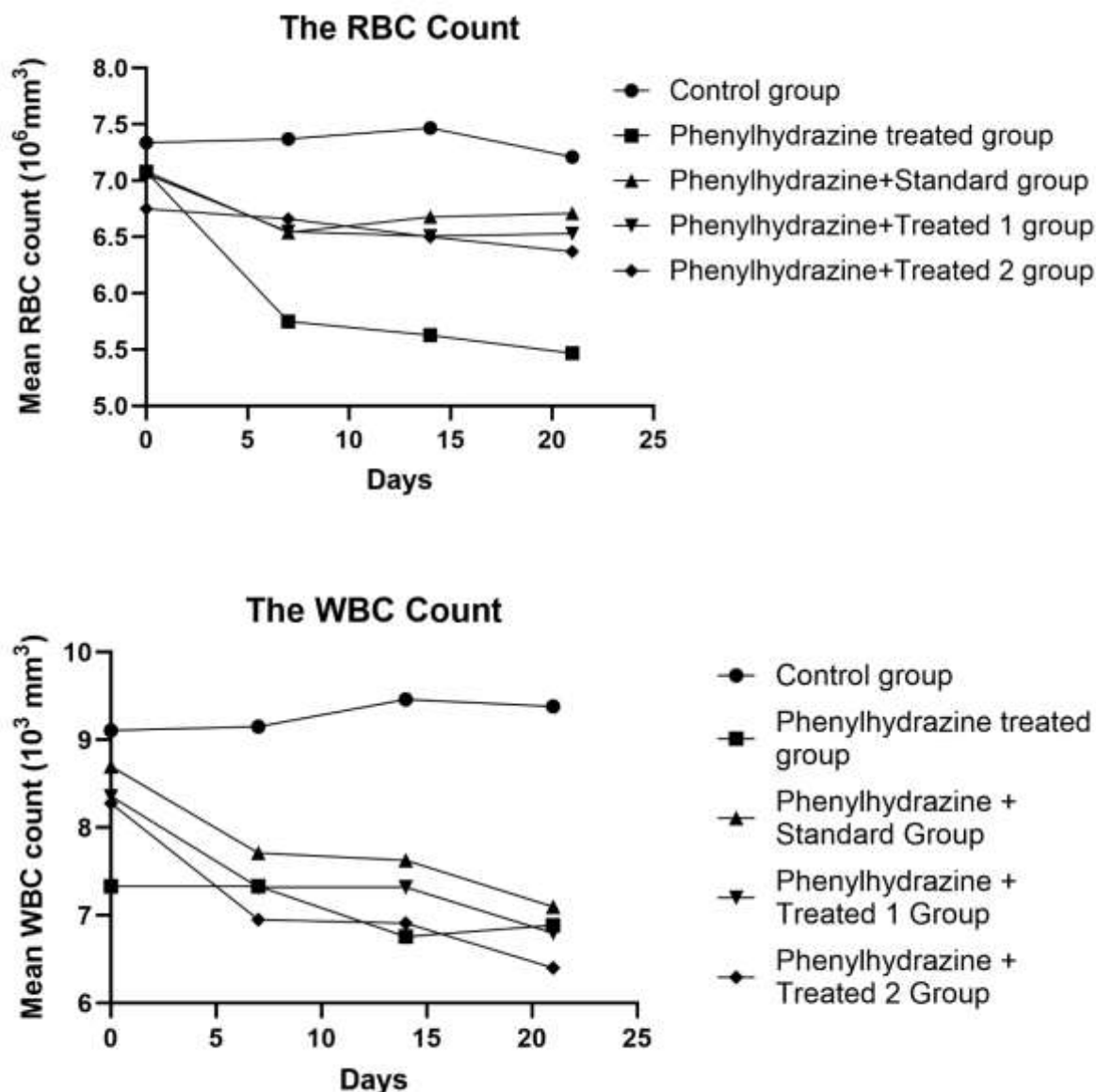
Experimental Design

Animals were randomly divided into **five groups**, each containing **six rats (n = 6)**.

Group I	Normal control (Vehicle only)
Group II	Anemic control (Phenylhydrazine only)
Group III	Standard (Phenylhydrazine + Ferrous sulfate 30 mg/kg, p.o.)
Group IV	Phenylhydrazine + Ethanolic extract of <i>Spirulina platensis</i> (200 mg/kg, p.o.)
Group V	Phenylhydrazine + Ethanolic extract of <i>Spirulina platensis</i> (400 mg/kg, p.o.)

Results and Conclusion





After haemoglobin estimation it was found that the control animals maintained relatively high haemoglobin levels throughout the experiment, approximately 11.5–12.7 g/dL. There was some normal fluctuation, but no progressive decline.

In phenylhydrazine-treated group it showed a clear and progressive reduction in haemoglobin:

Initial: ~11.6 g/dL, Day 7: ~11.0 g/dL, Day 14: ~9.8 g/dL, Day 21: ~9.3 g/dL this confirms that phenylhydrazine successfully induced anemia in the rats.

For phenylhydrazine + Standard group the standard-treated group showed a marked improvement in Hb: The increase compared with the phenylhydrazine group indicates that the standard treatment produced a strong anti-anemic effect.

In phenylhydrazine + Treatment 1 group treatment 1 showed an improvement in haemoglobin after anemia induction: Initial: ~11.1 g/dL Day 7: ~11.5 g/dL Day 14: ~12.0 g/dL Day 21: ~11.5 g/dL Thus, Treatment 1 appears to have a considerable anti-anemic effect, bringing Hb levels close to those of the control/standard groups. In phenylhydrazine + Treatment 2 group treatment 2 showed a smaller but

gradual improvement. This suggests a mild-to-moderate anti-anemic effect, although the improvement is less pronounced than with Treatment 1 and the standard.

After interpretation of the RBC Count Graph we found that The control group maintained a relatively stable RBC count throughout the study: Day 0: ~7. Day 7: ~7.3 Day 14: ~7.4 Day 21: ~7.2 This indicates normal and stable erythrocyte levels in the control animals.

For phenylhydrazine-treated group The phenylhydrazine group showed a marked and continuous reduction in RBC count: Day 0: ~7. Day 7: ~5.7 Day 14: ~5.65 Day 21: ~5.45

This substantial reduction indicates that phenylhydrazine successfully induced anemia, probably through destruction of RBCs (hemolysis).

Phenylhydrazine + Standard group The standard-treated group initially showed a decrease in RBC count, followed by gradual recovery: the recovery suggests that the standard treatment helped restore RBC production/count after phenylhydrazine-induced anemia.

In the phenylhydrazine + Treatment 1 group treatment 1 produced a gradual improvement after the initial decrease: The RBC count remained considerably higher than the untreated phenylhydrazine group at later time points, suggesting anti-anemic activity of Treatment 1.

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