SHORT COMMUNICATION

EFFECT OF AQUEOUS EXTRACT OF Brassica oleraceae var italic (Broccoli) INFLORESCENCE IN PHENYLHYDRAZINE INDUCED ANEMIC RATS

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The study was designed to evaluate the antianemic activity of aqueous extract of Brassica oleraceae var italic (Broccoli) inflorescence in phenylhydrazine induced anemia in Sprague Dawley rats. Phenylhydrazine treatment significantly decreased haemoglobin, RBC and MCH compared to normal group indicating the development of anemia. Standard group which received ferrous sulphate prevented all the changes caused by phenylhydrazine. Both the test groups showed significant improvement in RBC, haemoglobin and MCH. Phenylhydrazine treatment significantly increased WBC because of immune response and test groups normalized WBC. The present study concluded that aqueous extract of Brassica oleraceae var italic inflorescence has antianemic potential.

Key words: Anemia, Brassica oleraceae, Haemoglobin, RBC, Phenylhydrazine, Broccoli.

INTRODUCTION

Anemia is indicated as the decrease in the number of erythrocytes or the oxygen carrying capacity of blood which does not meet the physiological demand. Anemia is caused due to various factors such as inadequate absorption or intake of iron, reduced intake of vitamin B12 or folic acid, destruction of red bone marrow, hereditary conditions etc. (Koffuor et al 2012). Around 1.62 billion people are affected by anemia in the world which calibrates to 24.8% of the total population. Anemia is mostly prevalent in under developed and developing countries where malnutrition is a major problem. The present day therapy is based on herbal formulations rather than synthetic preparation for their low cost and easy availability. Plants are well known for their metabolites responsible for their biological effects since ancient times (Deb et al 2013; Rashid et al 2014; Sadanand and Palanivelu, 2015). Brassica oleraceae var italic (Broccoli), belongs to family Brassicaceae, known as 'crown jewel of nutrition', is a rich source of minerals such as potassium, phosphorus, calcium, iron, zinc, selenium and sodium, vitamins, especially vitamin A, C, K and folic acid (Madhu and Kochhar, 2014). The edible parts of broccoli are sprouts and florets commonly called as inflorescence (Figure 1).

Fig. 1. Broccoli plant with inflorescence
**Brassica oleracea** var **italica** was reported to have anticancer, antioxidant (Gawlik-Dzik et al 2014), antiseptic (Sanchez- Moreno, 2002), antiulcer (Vasanthi et al 2009), hypoglycaemic activities (Park et al 2012). Traditionally, it has been used in anemia but there is no scientific proof to support this claim. Hence, the study was undertaken to evaluate the antianemic property of aqueous extract of **Brassica oleracea** var **italica** inflorescences in phenylhydrazine induced anemia.

**MATERIAL AND METHODS**

**Plant extract**

Aqueous extract of **Brassica oleracea** var **italica** (Broccoli) inflorescence was gift sample from Green Chem Bangalore.

**Phytochemical screening of aqueous extract of** **Brassica oleracea** var **italica** inflorescence

Identification tests were performed to identify the presence of phytochemicals in aqueous extract of **Brassica oleracea** var **italica** inflorescence (Evans, 2002).

**Experimental animals**

Sprague Dawley rats of either sex (200-250 g) were obtained from the animal house of Krupanidhi Pharmacy college, Bangalore, India approved by CPCSEA (378/01/ab/CPCSEA). All the animals were maintained in a well ventilated room and given access to feed and water *ad libitum*.

**Experimental design**

Animals were divided into 5 groups of six each. Group 1 served as control and received normal saline. For induction of anemia, phenylhydrazine 60 mg/kg, i.p. for was given for two days (Ebuehi and Mbara, 2011).

Group 2 received phenylhydrazine alone whereas other groups received treatment after induction of anemia. Group 3 served as standard and received Fefol® at dose 0.012 mg/kg, p.o. (Chauhan et al 2014).

Group 4 and 5 received aqueous extracts of **Brassica oleracea** var **italica** inflorescence at doses of 100 and 200 mg/kg, p.o. respectively (Patel and Sharma, 2014). Treatments with standard drug and broccoli extract were continued up to fourteen days.

**Measurement of haematological parameters**

On day fifteen, blood samples were withdrawn by retro orbital route under mild ether anaesthesia. Fresh blood was immediately collected into heparinised tubes for measurement of routine hematological parameters. Haemoglobin estimation was done using Sahli’s method (Balasubramanian and Malathi, 1992). Red blood cell count and White blood cell count were done using Neubauer chamber method.

Mean Cell Haemoglobin (MCH) was calculated from following equation:

\[
MCH = \frac{[\text{Hgb (g%)} \times 10]}{\text{RBC count (mil/mm³)}}
\]

**Statistical analysis**

Statistical analysis was done by one-way ANOVA followed by Bonferroni multiple comparison test. All values of \(p<0.05\) were considered statistically significant.

**RESULTS AND DISCUSSION**

**Phytochemical investigation**

Phytochemical investigation of aqueous extract of **Brassica oleracea** var **italica** inflorescence showed the presence of alkaloids, saponins and terpenoids.

**Effect on haematological parameters**

Phenylhydrazine treatment significantly decreased haemoglobin, RBC (\(p<0.001\)). There is no significant change in MCH, whereas WBC count is found to be elevated (\(p<0.001\)) when compared with control (Table 1).

**Table 1.** Effect on haematological parameters on Hb, RBC, MCH, WBC

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Groups/Parameters</th>
<th>Hb gm% (gm/dl)</th>
<th>RBC (10^6/mm^3)</th>
<th>MCH (pg)</th>
<th>WBC (10^3/mm^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control</td>
<td>15.28 ± 0.22</td>
<td>6.57 ± 0.50</td>
<td>23.78 ± 1.42</td>
<td>6.875 ± 0.39</td>
</tr>
<tr>
<td>2</td>
<td>Phenyl hydrazine</td>
<td>9.43 ± 0.15***</td>
<td>4.25 ± 0.28***</td>
<td>24.17 ± 2.20</td>
<td>10.15 ± 0.3***</td>
</tr>
<tr>
<td>3</td>
<td>Standard</td>
<td>15.02 ± 0.24##</td>
<td>6.26 ± 0.40##</td>
<td>24.5 ± 1.84</td>
<td>6.95 ± 0.37##</td>
</tr>
<tr>
<td>4</td>
<td>Low dose of Broccoli</td>
<td>14.20 ± 0.35###</td>
<td>5.86 ± 0.22*</td>
<td>24.25 ± 0.74</td>
<td>7.583 ± 0.43###</td>
</tr>
<tr>
<td>5</td>
<td>High dose of Broccoli</td>
<td>14.35 ± 0.27###</td>
<td>6.06 ± 0.13##</td>
<td>23.69 ± 0.89</td>
<td>7.050 ± 0.18###</td>
</tr>
</tbody>
</table>

Values are given as mean ± SEM, \(n=6\) per group. ***\(p<0.001\) when compared with control. *\(p<0.05\) **\(p<0.01\) ***\(p<0.001\) When compared with Phenyl hydrazine treated group.
Aqueous extract of Broccoli at both doses has shown increased haemoglobin (p<0.001) when compared with phenylhydrazine treated group. Both low and high dose of Broccoli has increased RBC (p<0.05 and p<0.01) when compared with phenylhydrazine treated group. There was decrease of WBC count in standard and test groups (p<0.001) when compared with phenylhydrazine treated group. The results obtained by high dose of broccoli treatment has similar potency to standard (Table 1). Phenylhydrazine treatment causes haemolytic anemia by formation of reactive oxygen species. Reactive oxygen species formed will cause oxidative damage to RBC. Free radicals can also increase aging process of RBC cells. As a result, there will be decrease in RBC and haemoglobin. WBC cells are elevated as a result of body’s defence mechanism to get rid of haemolytic products (Koffuor et al 2012). Broccoli is a rich source of minerals like iron and vitamins like A, C, folic acid (Madhu and Kochhar, 2014) which may help in haemoglobin formation. The results of the present study confirmed the presence of alkaloids and saponins in aqueous extract of *Brassica oleracea* var *italica* inflorescence. Alkaloids are powerful antioxidants and prevent damage done to cells by free radicals (Ogbe et al 2010). Saponins help in enhancing natural resistance of body (Singh et al 1991). Hence, in the present study, alkaloids and saponins present in the plant may have protective role in phenylhydrazine induced anemia.

**CONCLUSION**

From the present study, it can be concluded that aqueous extract of *Brassica oleracea* var *italica* inflorescence has anti-anemic activity and this may be attributed due to presence of various minerals, vitamins and secondary metabolites such as alkaloids and saponins. Further studies are required to know the exact mechanism.

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**REFERENCES**


