



**A BRIEF REVIEW ON THE ROLE OF *BETA VULGARIS*, *PHYLLANTHUS EMBLICA*  
AND *PIPER NIGRUM* IN TREATMENT OF ANAEMIA**

Saloni Desai<sup>\*1,2</sup> and Chirag Desai<sup>2</sup>

<sup>1</sup>Research Scholar, Gujarat Technological University, Ahmedabad.

<sup>2</sup>Dept of Pharmacology; ROFEL Shri G.M. Bilakhia College of Pharmacy, Vapi.



\*Corresponding Author: Saloni Desai

Research Scholar, Gujarat Technological University, Ahmedabad.

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**ABSTRACT**

Anaemia is a prominent cause of health problems in many countries. It is a significant public health problem and the second leading cause of death and hospital admissions, respectively. Anaemia can be identified by low haemoglobin levels. In 75% of cases, anaemia, the most frequent consequence of liver cirrhosis, is present. A significant clinical consequence of anaemia is hepatomegaly. For thousands of years, anaemia has been empirically treated with herbal treatments. Even though taking an iron supplement is undoubtedly beneficial, there are some negative effects, such as gastrointestinal problems like nausea, constipation, vomiting, and discoloured teeth. The majority of populations use nutritional supplements and natural therapies to treat anaemic diseases. When compared to current medications, herbal therapy has a long history of use in the treatment and prevention of illnesses, including anaemia. All of the herbal solutions that are currently offered are mostly produced in liquid dose with a high concentration of active components. Therefore, there is a considerable but incomplete assessment of the risk of harmful drug-supplement interactions. In order to prevent harmful long-term consequences or immunological modulations, polyherbal formulations need to have fewer components. Therefore, it takes an hour to construct a polyherbal mixture with the fewest possible plants and the most medicinal potential. This review focuses on three medicinal plants, namely *beta vulgaris*, *Phyllanthus emblica*, and *piper nigrum*, along with their ethnopharmacological status, which are employed for the treatment of anaemia. This review article will provide more opportunities to rethink over utilising lesser herbs with greater efficacy might become better option in future.

**KEYWORDS:** Anaemia, Beetroot, Amla, Black pepper, ethnopharmacology, Polyherbal formulation.

**INTRODUCTION**

**Anaemia:** Anaemia (Panduroga) is a matter of public health concern in both developing and industrialized nations. It is a blood disorder that is among the oldest, most prevalent, and pervasive. Although anaemia affects individuals at all stages of life, preschool children and women of reproductive age are the most vulnerable population groups. Iron deficiency is the primary cause of anaemia, which can be attributed to a low intake of bioavailable iron from food. Adults and adolescents with anaemia experience reduced physical capability and work performance. Iron-deficiency anaemia (IDA) has been well-documented to have negative effects on behavior, cognitive performance, and physical growth in infants, preschool, and school-going children. Furthermore, it has been identified as a significant risk factor for maternal and child mortality.<sup>[1]</sup>

A deficiency in nutrients, as well as certain vitamins and minerals that are essential for the production of haemoglobin, may also be a contributing factor to the

onset of anaemia. Insufficient haemoglobin levels result in paler cells, a condition known as hypo-chromic anaemia. Iron deficiency is the most common cause of anaemia in adults, with various forms of anaemia existing, the most prevalent being iron deficiency anaemia. Red Blood Cells (RBC) contain haemoglobin, a protein that is rich in iron. Without adequate levels of iron, the body is unable to produce haemoglobin, which is essential for the delivery of oxygen-rich blood throughout the body. Additionally, deficiencies in folate and vitamin B12 can also impact the body's ability to produce red blood cells. Improper processing of vitamin B12 can lead to pernicious anemia.<sup>[1]</sup>

To prevent this condition, government has made rule to distribute iron tablets to girls in school and in healthcare sectors for pregnant ladies. Although iron supplementation is highly efficacious and effective, some people are often bored as it is associated with certain drawbacks, including gastrointestinal side effects such as nausea, vomiting, constipation, and tooth staining.<sup>[2-3]</sup>

Consequently, a natural diet that is rich in iron and vitamin B may prove beneficial in the treatment of anaemia. The therapeutic properties of herbal plants have been explored since ancient times, and they are considered nature's gift to living beings. As a form of medicine, herbs may be useful in treating anaemia. Nutritionists believe that blood-nourishing herbs aid in iron absorption while also providing additional benefits to the blood. They may help strengthen an individual's hematopoietic and immune systems, making them a promising alternative to traditional iron supplementation.<sup>[1]</sup>

***Beta vulgaris*:** *Beta vulgaris*, commonly referred to as "Chukander", is an herbaceous biennial plant belonging to the Chenopodiaceae family. It is characterized by its low caloric value and high sugar content. This crop is predominantly cultivated during the winter season and is grown globally, with its origins in Asia and Europe. Beetroot is a rich source of various vitamins such as vitamin A, B, and C, as well as minerals including calcium, magnesium, copper, sodium, iron, and phosphorus. Additionally, it possesses antioxidant properties.<sup>[2]</sup> The active constituents of beet root comprise carotenoids, glycine betanine, betacyanins, anthocyanins, tannins, saponins, folates, flavonoids, vitamins, fatty acids, and minerals. The primary constituent of beet root is Betaine (Betacyanin pigment), which is accountable for its red hue. Also, the primary sugar present in beetroot is sucrose.<sup>[4,5]</sup>

There exists a wide range of beetroot products that are distributed globally in the form of snacks, jams, and jellies.<sup>2</sup> Additionally, other functional foods available in the market include juice and juice mixtures, predominantly with lemon juice, gels, fermented and fractionated juice, dried powder in the form of tablets, capsules, micro-capsulated formulations, and crunchy beetroot slices, as well as beetroot enriched bread. Beetroot can be consumed raw, baked, or boiled. Red beets are delectable when roasted, pickled, eaten in salads, or made into soup.<sup>[4]</sup>

Among these, beetroots and beetroot juice are associated with numerous medical benefits, such as enhanced blood circulation, reduced blood pressure, improved exercise performance, enhanced skin health, cancer prevention, and support during pregnancy, among others. Beetroot is a rich source of folic acid, which aids in preventing neural tube defects in infants. As a result, beetroot is included in the diet of pregnant mothers. With a vast nutrient profile that includes vitamins C, folate, vitamin B-6, and essential minerals, beetroot provides significant health benefits to anaemic patients and pregnant women.<sup>[2]</sup> Beetroot increases haemoglobin levels and the amounts of haematocrit. It is enriched with a substantial quantity of folic acid, which is crucial for the growth of normal cells and tissues. Additionally, the iron content present in beetroot plays a pivotal role in the human body by facilitating the transportation of oxygen to red

blood cells, thereby aiding in the cure of anemia.<sup>[6]</sup> The iron present in beetroot is highly absorbable, making it an effective natural remedy for individuals of all ages who suffer from low blood haemoglobin and anemia.<sup>[3]</sup>

The consumption of beetroot juice has the potential to promote good health and improve athletic performance. It also exhibits some of the therapeutic properties for eliminating anaemia in female soccer athletes. The daily consumption of a serving of red beetroot juice not only furnishes the body with essential nutrients, but also serves as a safeguard against the onset of anemia.<sup>[7]</sup>

The study conducted by Walli RR et al. investigated the impact of beetroot juice consumption on Haemoglobin and Ferritin levels in a cohort of 12 healthy female subjects with a mean age of 31.8±6.6 years. Blood samples were collected from the participants at zero-time, day 11, and day 16 of daily consumption of 200 ml of beetroot juice. Additionally, the blood samples were analyzed for Complete Blood count and compared to the zero-time sample. The findings of the study suggest that beetroot juice consumption has significant effects on certain haematological parameters in healthy women, and may be utilized as a preventative and therapeutic measure for anaemia in women.<sup>[8]</sup> Further investigation is required to determine the optimal quantity of beetroot necessary for the effective prevention and treatment of anaemia. Additionally, it is imperative to assess the toxicity and concentration of active compounds present in beets to ensure their efficacy. Furthermore, the expression of genes associated with the impact of beetroot on anaemia is essential to elucidate the mechanism by which beetroot regulates anemia.<sup>[7]</sup>

***Phyllanthus emblica*:** *Phyllanthus emblica* Linn. (Also known as *Emblica officinalis*) is a member of the *Euphorbiaceae* family and is commonly referred to as Indian gooseberry or amla. This plant is highly nutritious and has the potential to serve as a significant dietary source of vitamin C (600mg/100g), iron (1.2mg/100g), amino acids and minerals. Additionally, *Phyllanthus emblica* contains various phenolic compounds, including phyllembelic acid, phyllembelin, rutin, curcuminoids, and emblicol.<sup>[9]</sup>

According to ayurveda, amalakyavaleha is employed for the treatment of anemia.<sup>[10]</sup> Amla, being abundant in Vitamin C or ascorbic acid, serves as a crucial component aiding in the assimilation of Iron.<sup>[11]</sup>

The combined use of Neem leaves (*Azadirachta indica*) and amla has been found to have a significant synergistic effect in treating patients with iron deficiency anaemia. Amla fruits are known to contain various beneficial components such as vitamin C, tannins, flavonoids, ellagic acid, gallic acid, quercetin, and other constituents. Neem leaves, on the other hand, are a valuable source of iron, while amla contains ascorbic acid, which aids in the absorption of iron. The convincing results observed in

this study highlight the potential benefits of amla supplements for patients suffering from iron deficiency anaemia.<sup>[12]</sup>

Additionally, Bhuvanewari G et al. conducted a study on the Effects of a mixture of Honey, dates, and Amla on the level of Fatigue in Adolescent Girls with Iron Deficiency Anaemia in a selected setting. The study employed a true experimental design with pre-test and post-test measurements. The subjects were randomly assigned to either the control or experimental group. The intervention was administered to the experimental group. The FACIT fatigue severity scale was utilized to evaluate the level of fatigue. The results indicated a significant difference between the pre-test and post-test levels of fatigue in the experimental group. The mean values for fatigue increased in the experimental group. Consequently, it was concluded that the combination of these three extracts contributed to an improvement in haemoglobin levels, thereby enhancing the quality of life and reducing fatigue. This intervention can be routinely administered to adolescent girls, even in rural areas, to promote a sense of satisfaction.<sup>[13]</sup>

**Piper nigrum:** *Piper nigrum*, commonly referred to as black pepper, is a member of the *Piperaceae* family. *Piper longum*, also known as long pepper belongs to the same family. Its primary chemical constituents include piperidine,  $\alpha$ -terpineol, acetophenone, hexonal, citral, and piperolnol. Piperidine, a nitrogen alkaloid found in *Piper nigrum* and *Piper longum*, is known to facilitate iron absorption.

A variety of formulations containing piperidine are commercially available. Vardhamana Pippali Rasayana, a combination of *Piper nigrum*, honey, and ghee, is utilized in the treatment of anaemia and various other ailments, including bronchitis, chronic rhinitis, and rheumatoid arthritis.<sup>[14]</sup> Pippalyedyesava, a formulation of black pepper, long pepper is used in curing anaemia, piles and abdominal lump.

In their study, Lazaro DF et al aimed to elucidate the effects of the concomitant administration of iron (Fe) and black pepper on physically active healthy individuals. Fe is a micronutrient that plays a crucial role in enhancing athletic performance by influencing the

Physiological functions involved in endurance sports, such as improving the transport, storage, and utilization of oxygen. Athletes are particularly susceptible to Fe depletion, Fe deficiency, and anaemia due to various factors, including mechanical haemolysis, gastrointestinal disturbances, and excessive sweating. The decline in Fe stores has been shown to negatively impact physical capacities, such as aerobic capacity, strength, and skeletal muscle recovery in elite athletes. Therefore, it is imperative to maintain Fe storage, even if Fe intake meets the recommended daily allowance (RDA), and Fe supplementation may be warranted in

physically active individuals with or without anaemia and Fe deficiency. Females, in particular, should monitor their Fe haematological profile. The recommended oral Fe supplements are ferrous or ferric salts, sulphate, fumarate, and gluconate, which constitute the first line of treatment. However, the high doses administered have gastrointestinal side effects that reduce tolerance and adherence to treatment. Therefore, a strategy to counteract these adverse effects is to improve the bioavailability of Fe. Piperine, a bioavailability enhancer, may benefit the absorption of Fe. The three research studies conducted by Lazaro DF et al on Fe associated with black pepper have reported improvements in parameters related to the metabolism of Fe, without any adverse effects. Although further research is necessary, this could represent a significant advancement in oral Fe supplementation for physically active individuals.<sup>[15]</sup>

It is purported that black pepper can prevent anaemia of inflammation by inhibiting the over- expression of hepcidin through the BMP6-SMAD1/IL6-STAT3 signalling pathway.<sup>[16]</sup>

## CONCLUSION

Anaemia, one among the most common blood disorders, occurs due to the decreased levels of healthy red blood cells (RBCs) in the body. Globally as well as in India, anaemia has a high incidence and it is expected to elevate in the future. Hence, there is a need to prevent it and also to seek for better and more cost-effective treatment strategies for it. Anaemia is most common in the developing world, where the causes are multifaceted. Several studies have found a high prevalence of anaemia in adolescent boys and girls. Adolescent health is the most important indicator of a country's development. As a result, immediate attention is required in this area. Evidence suggests that combining preventive supplementation with nutrition education may be a more efficient strategy for improving compliance and nutrition status. As discussed, according to certain research, the haemoglobin levels of women in the reproductive age range improved significantly after providing beetroot juice daily. The majority of populations use nutritional supplements and natural therapies to treat anaemic diseases. When compared to current medications, herbal therapy has a long history of use in the treatment and prevention of illnesses, including anaemia. All of the herbal solutions that are currently offered are mostly produced in liquid dose with a high concentration of active components. Therefore, there is a considerable but incomplete assessment of the risk of harmful drug-supplement interactions. In order to prevent harmful long-term consequences or immunological modulations, polyherbal formulations need to have fewer components. Therefore, it takes an hour to construct a polyherbal mixture with the fewest possible plants and the most medicinal potential. In the near future, it will be necessary to develop a complete natural therapy to combat iron deficiency employing these three underutilized species. The substances found in herbal

extracts, such as flavonoids and phenols, are responsible for their hematinic activity. This widely cited and well-documented review will undoubtedly aid researchers in the development of appropriate anaemia treating drugs from ethnomedicinal plants.

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