Original Research Article

Evaluation of total iron content of aqueous fruit extract of basella rubra

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Abstract

Background: Basella rubra is perennial vine that likes tropical conditions, but is also cultivated as an annual crop in temperate regions. It has long tradition of use for its nutritious and medicinal values. In south-east asia it has been consumed for centuries for malaria, melanoma, leukemia and oral cancers. Here we aimed to evaluate the total iron content in the basella rubra fruit extract. **Methods:** In the present study iron content estimation was done by two methods, UV estimation and atomic absorption. Results: The content of Iron in the microwave digested sample was found to be 1.03mg/L by atomic absorption spectroscopy. The Iron-1,10-phenanthroline complex method was used for UV method and the Fe content was found to be 0.9mg/L. **Conclusions:** The plant showed good potential for being included in polyherbal formulations as phytonutrient.
Keywords: Basella rubra, UV estimation, absorption spectroscopy, Iron estimation.

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Received Date: 02/11/2019 Revised Date: 04/12/2019 Accepted Date: 09/01/2020
DOI: https://doi.org/10.26611/10101323

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 19 February 2020

INTRODUCTION

Basella rubra belongs to the family Basellaceae, and commonly known as Malabar spinach, Indian Spinach, ceylon spinach and vine spinach. Malabar spinach is a perennial vine and grown as annual or biennial pot-herb. It bears white or white-pink color tiny flowers depending upon the species and purple to black color berries. Basella rubra has pink or purplish stems and pink color veins running across its leaves. Basella is one of versatile leafy green vegetable and revered in some East Asian cultures for its wholesome phytonutrient profile. Basella is very low in calories and fats. Nonetheless, it holds an incredibly good amount of vitamins, minerals, and antioxidants. Fresh leaves, particularly of basella rubra, are rich sources of several vital carotenoid pigment anti-oxidants such as ß-carotene, lutein, zeaxanthin. Together, these compounds help act as protective scavengers against oxygen-derived free radicals and reactive oxygen species (ROS) that play a healing role in aging and various disease processes. Its thick, fleshy leaves are an excellent source of non-starch polysaccharide, mucilage. In addition to natural fiber (roughage) that found in the stem and leaves, its mucilaginous leaves facilitate in smooth digestion. Fiber diet brings a reduction in cholesterol absorption, and help prevent bowel problems. Vine spinach leaves and stem are incredibly rich sources of vitamin A. It also contains good amounts of many B-complex vitamins such as folate, vitamin-B6, and riboflavin. 100 g fresh leaves provide 140 µg or 35% of folates. This vitamin is one of the essential compounds for DNA production and growth. Folate deficiency in during very early stages of pregnancy might results in the neural tube defects in the newborn baby. Anticipating and pregnant women are, therefore, advised to include a lot of fresh greens in their diet to help prevent neural tube defects in the offspring. Further, basella leaves are good

How to cite this article: S Thamizharasan, C S Brethis, S A Sridevi, B Kalaiselvi, S Umamaheswari, R Rajkamal Evaluation of total iron content of aqueous fruit extract of basella rubra. *MedPulse International Journal of Pharmacology.* February 2020; 13(2): 20-22. https://www.medpulse.in/Pharmacology/

sources of minerals like potassium, manganese, calcium, magnesium, and copper. It has been found to be a good source of calcium, iron,vitamin A and vitamin C. In Ayurveda, the plant has shown immense potential in androgenic, antiulcer, antioxidant, cytotoxic, antibacterial activity, anti-inflammatory, central nervous system (CNS) depressant activity, nephroprotective and wound healing properties etc. This paper includes pharmacological and phytochemical properties particularly iron content of the Basella rubra fruit extract, which may be helpful to establish a standard natural drug for further research.

MATERIALS AND METHODS

The fruits of Basella rubra was collected from Noombal village, Thiruvallur district and the plant was authenticated by Dr. jayaraman plant anatomy research centre, Chennai.

ESTIMATION OF IRON CONTENT

Spectrophotometric determination of Fe^{2+} ions using 1,10-phenanthroline: 1. Weigh accurately about 0.07 g of pure ferrous ammonium sulfate hexahydrate, dissolve it in water, and transfer the solution to a 1-liter volumetric flask. Add 2.5 mL of concentrated sulfuric acid and dilute the solution to the mark. Calculate the concentration of the solution in mg of iron per mL. (Remember, your solution was prepared using Fe $(NH_4)_2(SO_4)_2 \cdot 6H_2O$). 2. Prepare the unknown sample as follows. Add about 20g fresh fruits and approximately 100mL 10% sulfuric acid. Crush these leaves using mortar and pestil and filter. Now transfer a 1mL this solution to another 100 mL volumetric flask. This will be referred to as the "prepared unknown". 3. Into another five 100 mL volumetric flasks, pipette (volumetrically) 1, 5, 10, 15, 20, and 25 mL portions of the standard iron solution. Put 50 mL of distilled water into another flask to serve as the blank. To each flask, including the "prepared unknown", add 1 mL of the hydroxylamine solution, 10 mL of the 1,10 phenanthroline solution and 8 mL of the sodium acetate solution. Then dilute all the solutions to the 100 mL marks and allow them to stand for 10 minutes with occasional shaking of the flasks. 4. Using the blank as a reference and any one of the iron solutions prepared above, measure the absorbance at different wavelengths in the interval from 400 to 600 nm. (Note that it is necessary to re-adjust the 0% T and 100%T settings whenever the wavelength is changed). Take reading about 20 nm apart except in the region of maximum absorbance where intervals of 5 nm should be used. Plot the absorbance vs. wavelength and connect the points to from a smooth curve. Select the proper wavelength to use for the determination of iron with 1,10- phenanthroline. 5. Measure the absorbance of each of the standard solutions and the unknown at the selected wave length . Plot the absorbance vs. the concentration of the standards. Note whether Beer's law is obeyed. Using the absorbance of the unknown solution calculate the % (w/w) iron in sample solution

Table 1: Spectrophotometric determination of fe^{2+} ions using 1,10-phenanthroline

Standard solution	Concentration of standard solution(mg/L)	Absorbance(nm)
1 ml	0.108	0.051
5 ml	0.492	0.066
10 ml	1.08	0.196
15 ml	1.659	0.298
20 ml	2.25	0.370
25 ml	2.87	0.480

Total iron determination by atomic absorption spectroscopy Microwave digestion: To prepare the plant materials for total iron determination, accurately weighed samples (0.5 g) were digested with the mixture of 30% H_2O_2 and concentrated 65% HNO_3 (3:5, v/v). Next the samples were transferred to 50 ml volumetric flasks and diluted with the twice distilled water.

RESULTS

The given sample complies the limit test for iron as per the Indian Pharmacopoeia. spectrophotometric data shows that absorbance of sample solution is found to be 2.87 at 480 nm. So the concentration of sample from the standard graph is calculated as 1.1 mg/L (Table 1). Atomic absorption spectroscopic method for total Iron estimation of microwave digested sample is reported that 100ml of extract contains 1.03mg of iron.

DISCUSSION AND CONCLUSION

Trace elements have important role in various human metabolic processes. In the present study Atomic absorption spectroscopy has been used to determine the iron content and to carryout quantitative estimation. The experimental data of the present work will be of immense importance in formulation of new Ayurvedic proprietary medicines and managing dose of a particular formulation. 100 g fresh leaves provide 8000 IU or 267% of recommended daily allowance of this vitamin. Vitamin-A required for maintaining healthy mucus membranes and skin, and essential for good eyesight. Consumption of natural vegetables and fruits rich in vitamin-A and flavonoids has been thought to offer protection from the lung and oral cavity cancers. Basella has more vitamin C content than English spinach. 100 g of fresh greens contains 102 mg or 102% of daily recommended levels of vitamin-C. Vitamin-C is a powerful antioxidant, which helps the human body develop resistance against infectious agents and scavenge harmful oxygen-free radicals. Likewise in spinach, basella too is an excellent source of iron. 100 g fresh leaves contain about 1.20 mg or 15% of daily intake of iron. Iron is an essential trace element required by the human body for red blood cell production. Additionally, this element acts as a co-factor for the oxidation-reduction enzyme, cytochrome oxidase, during the cellular metabolism. Good knowledge about the iron content and the factors which increase its bioavailability will help to select proper food to be included in the diet. Proper selection of food will in turn help to reduce iron deficiency anemia in our country.

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Source of Support: None Declared
Conflict of Interest: None Declared