

# Antioxidant assay and elemental analysis of *Breynia vitis-idaea* (Burm.f.) C.E.C. Fisch (Phyllanthaceae Martynov)

Preetha P.S.<sup>1</sup> and Anjali Krishnan<sup>2</sup>

Department of Botany, Sree Narayana College, Kollam 691 001, Kerala, India

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## ABSTRACT

*Breynia vitis-idaea* (Burm.f.) C. E. C Fisch is a perennial tree like species of phyllanthaceae family that is traditionally used for various medicinal purposes. The present study was carried out to evaluate the traditional claims and to identify the active compounds present in the *Breynia vitis-idaea* (Burm.f.) C.E.C. Fisch. Antioxidant activities such as 1- diphenyl-2- picrylhydrazyl (DPPH) assay in Ethanolic extract of *Breynia vitis-idaea* (Burm.f.) C. E. C. Fisch shows increase as the concentration increase. It may be used as a potential source to prevent oxidative stress related diseases. Elemental analysis such as iron, lead, copper, manganese, zinc and cadmium was done to determine the metal composition in the plant *Breynia vitis-idaea* (Burm.f.) C.E.C. Fisch by using Atomic Absorption Spectrophotometer. The result of the analysis showed that *Breynia vitis-idaea* shows high amount of manganese as compared to other elements. The study of *Breynia vitis-idaea* unveils its promising antioxidant potential and elemental composition, paving the way for its future use in therapeutic applications and further scientific exploration.

**Keywords:** *Breynia vitis-idaea*, Phyllanthaceae, Atomic Absorption Spectroscopy.

## Introduction

Plant- based medicines that prevailed all over the world have been archived since the ancient generation. Two-thirds of the world's plant species have medicinal value, and nearly all of them have antioxidant potential (Krishnaiah *et al.* 2011). The studies on the plant *Pseuderanthemum crenulatum* (Wall. ex. Lindl) Radlk. revealed that it has feeble antioxidant activity (PPS and Sreelekshmi, 2024). *Breynia vitis-idaea* (Burm.f.) C.E.C. Fisch. is a small evergreen shrub or understorey plant belonging to the family Phyllanthaceae. Native to tropical and subtropical regions of Asia and the Pacific, it is often found in forested areas, shaded slopes, and along the road-

sides. The plant typically grows up to 1-2 meters in height and is characterized by its alternate, simple, ovate leaves and small, inconspicuous greenish flowers. *Breynia vitis-idaea* is also used in traditional medicine in some cultures and is valued as an ornamental plant for its dense foliage and graceful appearance.

This study focuses on antioxidant activity and elemental composition of the species, *Breynia vitis-idaea* (Burm.f.) C.E.C. Fisch. It is characterized by its smooth, slender stems and glossy, elliptic-ovate leaves (2-5/cm long) with entire margins.. Its inconspicuous, Monoecious flowers form in small clusters at leaf axils; female flowers produce fleshy, round berries that ripen from green to bright red, measur-

(<sup>1</sup>Associate Professor, <sup>2</sup>P.G. Student)

ing roughly 5-8/mm in diameter, The plant thrives in shaded under stories of tropical forests, tolerates a range of soil types and displays moderate drought resistance. Its berries feed birds and other wildlife, making it an important ecological component of its native Southeast Asian habitats. *Breynia vitis-idaea* is versatile and adaptable plant that can thrive in environment across tropical Asia.

In this study the methanolic extract of *Breynia vitis-idaea* (Burm.f.) C. E. C. Fisch was screened for its antioxidant activity. Radical scavenging activity of the test sample against stable 2, 2- diphenyl 1- picrylhydrazyl hydrate (DPPH) was determined according to the method of Brand William *et al.* (1995) with slight modification. DPPH reacts with an antioxidant compound, which can donate hydrogen, and reduce DPPH. The change in colour (from deep violet to light yellow) was measured at the optical density 515 nm on a UV visible spectrophotometer.

Atomic Absorption Spectroscopy provides cost effective feasible solution for the analysis of trace elements. The presence or absence of trace metals is a factor of apprehension regarding human health and safety. Thus, AAS technique can be utilized for quantification of elemental composition. The leaves of *Cyathula prostrata* (L.) Blume. contains various important metals like copper, iron, calcium, chromium, nickel, sodium, cadmium, Lead, manganese, silver, magnesium and zinc (PPS and Shaniya Mol, 2024). The elemental analysis of nine selected species of *Ipomoea hederifolia* using Atomic Absorption Spectroscopy showed that Iron, Zinc, Chromium &, Nickel content is high in *Ipomoea hederifolia* L. as compared to other species The elements present in the *Breynia vitis-idaea* was analysed using Atomic Absorption Spectroscopy. Six different elements like iron (Fe), Copper (Cu), Manganese (Mn), Chromium (Cr), Lead (Pb) and Zinc (Zn) were analyzed using atomic absorption Spectroscopy.

## Materials and Methods

### The study area

*Breynia Vitis-idaea* (Burm.f.) C.E.C Fisch plants were collected from Thiruvananthapuram district of Kerala. The district lies between 8.7379° North latitudes and between 76.7163° East longitudes.

### Study method

Radical scavenging activity of the test sample

against stable 2, 2- diphenyl 1- picrylhydrazyl hydrate (DPPH) was determined according to the method of Brand William *et al.* (1995) with slight modification. DPPH reacts with an antioxidant compound, which can provide hydrogen, and reduce DPPH. The collected sample is well dried, mixed well and blended using mortar to get fine powder. The well mixed fine powdered sample of about 1 to 2g is weighed into a pre weighed crucible and heated for overnight at 500 °C and let cool. Then strong acid and weak acid is added in the ratio 1:3 for digestion of the tissues. The solution is made up to 250 ml with distilled water and heated until it reaches 125 ml. Then it is finely filtered by using the filter paper and kept under refrigerator for analysis.

The elements present in the plant was analyzed using Atomic Absorption Spectroscopy (Model Pin AAcle 900 series AAS). *Breynia vitis-idaea* (Burm.f.) C.E.C. Fisch. is collected and the whole plant were washed with running tap water and the clean plant material were shade dried and then crushed well into a fine powder form using mortar. The sample solution was prepared by adopting standard procedures for trace elemental analysis.

## Results and Discussion

Antioxidant activity was determined by using DPPH (2,2-diphenyl 1-picryl hydrazyl) assay principle. The phyto-chemicals are known for its antioxidant activity. They protect our cells against oxidative damage thereby reducing the risk of developing serious diseases. A decrease in absorbance of DPPH solution indicates an increase in DPPH scavenging activity. Methanolic extract of the plant at different concentrations exhibited different percentage of inhibition (Table 1). The studies showed that *Breynia vitis-idaea* is antioxidant in nature and showed an instantaneous colour change, with the addition of DPPH. As the concentration of the methanolic extract increased its antioxidant potentiality also increased. The effect of various concentration of extract (0.2,0.4,0.6,0.8,1 mg/ml) were found to be 29%, 37%, 45%, 57%, 65% respectively (Figure 1).

Elemental analysis was done to determine the metal composition in the plant *Breynia vitis-idaea* (Burm.f.) C.E.C. Fisch. Six different elements in *Breynia vitis-idaea* were studied (Table 2) which includes elements such as iron, lead, copper, manganese, zinc and cadmium. The amount of manganese

**Table 1.** Antioxidant activity of methanolic extract of *Breyniavitis-idaea*

Concentration of sample ( $\mu\text{g/ml}$ )	Absorbance of Control	Absorbance of Sample	% of Inhibition
0.2	0.387	0.274	29%
0.4	0.387	0.240	37%
0.6	0.387	0.210	45%
0.8	0.387	0.165	57%
1.0	0.387	0.135	65%

Each result is an average of at least three independent measurements with a precision of about  $\pm 1\%$ .

and zinc is more as compared to other elements. The concentration of iron (Fe) is 1.940, Lead (Pb) is 0.5, Copper (Cu) is 0.347, Manganese (Mn) is 7.832, zinc (Zn) is 2.414 and Cadmium (Cd) is 0.1.

**Table 2.** Elemental analysis of *Breynia vitis-idaea* (Burm.f.) C. E. C. Fisch.

Sl No.	Elements (parameters)	mg/l
1.	Fe ( mg/l)	1.940
2.	Pb (mg/L)	0.5
3.	Cu (mg/l)	0.347
4.	Mn (mg/L)	7.832
5.	Zn (mg/l)	2.414
6.	Cd ( mg/l)	0.1

Antioxidants are molecules that prevent or reduce free radical reactions and delay or inhibit cellular damage. Antioxidants exist both enzymatic and non- enzymatic forms in the intracellular and extracellular environment, can be effectively used in preventing free radical formation by scavenging them or promoting their decomposition (Sini *et al.*, 2010). Methanolic extract of the dried leaf powder used to determine the anti-oxidant activity. Ascorbic acid is used as standard for estimating antioxidant activity. Absorbance was measured at 515nm by UV spectrophotometer Lower absorbance of the reac-

tion mixture indicated higher free radicle activity. The existence and amounts of distinct components in various plants rely on the soil's composition, fertilizers and water used, as well as their acceptability plant selectivity and absorbability for the absorption of these elements by plants. The uptake of the elements depends on the type of the plants and the environment.

The present study of *Breynia vitis-idaea* show high amount of manganese (7.832 mg/IL). Manganese is an essential element in all living organisms. It functions as a co factor for variety of enzymes including those involved in neurotransmitter synthesis and metabolism (Erikson and Aschner, 2003). Manganese deficiency causes slow growth of hair and nails, reduced levels of clotting proteins, dermatitis, and increased alkaline phosphatase activity. The permissible set for manganese by FAO and WHO in Medicinal plants is 200 mg/kg and its daily intake can be 11mg/day (World Health Organization (WHO), 1998).

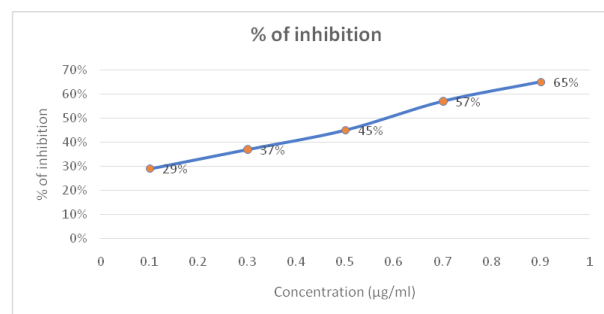
Zinc is a trace mineral and it plays key role in growth of cells, DNA synthesis, healing damaged tissue, building proteins, supporting healthy immune system. Zinc composition in *Breynia vitis-idaea* is 2.414 mg/l whereas lead composition in *Breynia.vitis-idaea* is 0.5 mg/l. The study of *Breynia vitis-idaea* reveals its promising antioxidant potential and elemental composition, paving the way for its future use in therapeutic applications.

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## Conflict of Interests

The authors declare that there is no conflict of inter-

**Fig. 1.** % of inhibition with different concentrations of plant extract of *Breyniavitis-idaea*.

ests regarding the publication of this paper.

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