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Phytochemical screening of bioactivities in different extracts of Boerhavia diffusa Linn

Prof. Manoj Kumar

Department of Botany, College of Commerce, Arts and science Patna

ABSTRACT

Traditionally, Boerhavia diffusa (Nyctaginaceae) has been utilised as a medicinal plant to treat a variety of illnesses. Using aqueous extraction, the current work sought to determine the phytochemical content of Boerhavia diffusa's leaves, stem, and roots. Saponins, flavonoids, terpenoids, phenolic compounds, reducing sugars, steroids, alkaloids, and carbonyl compounds were among the bioactive substances found by qualitative phytochemical analysis. The study discovered that different plant portions varied in terms of the presence or lack of bioactive chemicals. The results demonstrate Boerhavia diffusa's potential for the creation of novel medications and support its long-standing medical usage.

Keywords: ***Bioactive compounds, medicinal uses, punarnava***

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Introduction

Nearly majority of the 40 species of the genus Boerhavia are found in tropical and sub-tropical regions of Asia, Africa, America, and Australia [1–2]. They include Boerhavia diffusa Linn. (Synonym: Nyctaginaceae; Boerhavia glabrata Blume) One of the most researched plants, Boerhavia diffusa , has long been used by tribal and indigenous peoples as well as in Ayurvedic and Unani therapies. The miraculous medicinal plant is used to treat 22 different conditions in Ayurveda and Unani medicine. The plant has 23 documented applications in Brazilian pharmacopoeia, and it is recommended for 14 different conditions throughout Africa and the Middle East [1]. Among the colloquial names for Boerhavia diffusa are Pigweed, Spreading Hogweed (English), Gondhapurna, and Punarnava (Bengali, Sanskrit) [2].

The plant is a prolific perennial creeping or climbing herb that shows sporadic effectiveness, peaking in activity during the summer months of May [3].Traditional medicine treats diabetes, stress, dyspepsia, stomach discomfort, inflammation, jaundice, splenic enlargement, heart disease, bacterial infections, and impotence with the root and entire plant of Boerhavia diffusa [4,5]. Additionally, it has been shown to be effective as an antiviral agent and in the treatment of a number of hepatic illnesses, night blindness, corneal ulcers, and elephantiasis [5,6]. It has been frequently utilised in Nigerian traditional medicine to alleviate menstrual discomfort, infertility, and epilepsy [7, 8].

Anticonvulsant [4], diuretic, anti-inflammatory, antifibrinolytic [9], antibacterial [10], anti-hepatotoxic, anthelmintic, febrifuge, anti-leprosy, antiasthmatic, antiurethritis, antilymphoproliferative [11], antimetastatic [12], immunosuppressive [13], antidiabetic, antioxidant [14], immune-modulation [15], hepatoprotective [16], anti-nociceptive, nephroprotective [17], bacteria-induced ulcer & diarrhoea [18], and antiurolithiatic [19] properties have been established by pharmacological studies.

Despite its long history of usage, Boerhavia diffusa 's phytochemical makeup and pharmacological characteristics require scientific confirmation. The objective of this work was to use aqueous extraction to examine the phytochemical content of several plant parts (leaves, stem, and root) of Boerhavia diffusa .

Materials and Methods

Boerhaavia diffusa was collected from Botanical garden of College of Commerce arts and sciences,

Patna in the month of August. The different parts of the plant were washed with running tap water, and then rinsed with distilled water to remove the soil and dust particles adhered on the surface of the sample. The sample was dried in shade. Dried powder of Boerhavia diffusa was extracted by Soxhlet apparatus [20,22,23].

250 gm of dried plant parts were grind in mixture, finely grinded powder was extracted by using Soxhlet apparatus with distilled water for 6 hrs at 80°C. The solvent was removed by distillation and semisolid mass was dried by using hot water bath at 40-50°C and the yield was weighted. % yield of crude extracts calculated. The yield of water leaves extract was 5 gm , root extract 4.62 gm and stem extract was 5.14 gm.

Phytochemical screening

The freshly prepared crude extracts of Boerhavia diffusa were qualitatively tested for the presence of Alkaloids (Hager's test), Flavonoids (Modified Ammonia Test), Steroids (Salkowski test), Terpenoids (Modified Salkowski test), Reducing sugars (Fehling's test), Saponins (Frothing test), Tannins ($FeCl_3$ test)[24].

Test for tannin: About 1 ml of the filtrate extract was taken, and 3-5 drops of 10% lead acetate solution was added to it. The gelatinous precipitate formation confirmed the presence of tannin.

Test for saponin: About 1 ml of the filtrate extract was added to 1 ml of distilled water and shaken well. The formation of persistent froth was observed, confirming the presence of saponin.

Test for flavonoids: About 1 ml of the extract **was** taken. Two ml of 2% NaOH solution and 3 to 4 drops of dilute HCl were added to it. The colour initially turned to an intense yellow colour with NaOH solution and later became colourless. This colour change in appearance confirmed the presence of flavonoids.

Test for terpenoids: Six drops of chloroform were added to 1 ml of the filtrate and placed in the water bath for a few minutes. Then, 6 drops of concentrated sulphuric acid were added. The reddish-brown interface confirmed the presence of terpenoids.

Test for phenolic groups: About 1 ml of the filtrate extract was taken. A few drops of 5% ferric chloride solution were added. The dark bluish-black appearance confirmed the presence of phenolic compounds. [25].

Test for reducing sugars: About 1 ml of the extract was taken, and 2 drops of Fehling's solution A followed by Fehling's solution B were added and kept in the water bath for some time. The presence of red-orange precipitate confirmed the presence of reducing sugars [26]

Test for steroids: About 1 ml of the extract was taken. One ml of chloroform and one ml of concentrated sulphuric acid were added. The appearance of upper red and lower yellow with green fluorescence indicates the presence of steroids.

Test for alkaloids: To about 1 ml of the extract, 3 to 4 drops of Dragendroff's reagent were added. The formation of a reddish-brown precipitate confirmed the presence of alkaloids. Test for carbonyl compounds: About 1 ml of the filtrate extract was taken, and 3 to 4 drops of 2,4- Dinitrophenyl hydrazine (DNPH) reagent were added. The formation of yellow crystals confirmed the presence of carbonyl compounds.

Results and Discussion

Preliminary phytochemical screening showed (Table 1)The presence or absence of alkaloids, flavonoids, steroids, Terpenoids, reducing sugars, saponins, tanninsin varying amount in the Boerhavia diffusa extracts.

Table -1

Qualitative phytochemical screening of different plant parts of Boerhavia diffusa

Bioactive Components	Leaves	Stem	Root
Tannins	Absent	Absent	Absent
Saponins	Present	Absent	Present
Flavonoids	Absent	Absent	Present
Terpenoids	Present	Present	Absent
Phenolic compounds	Present	Present	Absent
Reducing sugars	Present	Present	Present
Steroids	Absent	Absent	Absent
Alkaloids	Present	Present	Present

According to earlier research, Boerhavia diffusa contains alkaloids, tannins, carbohydrates, glycosides, proteins and amino acids, phytosterols, phenolic compounds, flavonoids, and terpenoids. [5, 18] There was a correlation between the current study and the previously mentioned investigations. The biological activity of Boerhavia diffusa extracts are significantly enhanced by the presence of a variety of chemical substances.

Conclusion:

The organic solvent extracts of Boerhavia diffusa's aerial component are a great source of phytochemicals and exhibit notable in vitro bioactivities that can help treat a variety of common illnesses, from the common cold to more serious pathological conditions. Laboratory research is underway to identify the active ingredients that give the plant its high medicinal value and bioactivities.

Conflict of interest statement

We declare that we have no conflict of interest.

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