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Physicochemical and phytochemical exploration on flower of *Delonix regia*

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Abstract

Delonix regia flower extracts and its different solvent fractionates were evaluated for physicochemical and preliminary phytochemical screening through standard tests. The present study deals with phytochemical explorations of *Delonix regia* flower including determination of loss on drying, ash values and extractive values. The qualitative chemical examinations revealed the presence of various phytochemicals like flavanoid, terpenoid saponins, phenolic compounds, carbohydrates, tannins and glycosides in the flower extracts of this plant. The presence of various bioactive constituents confirms the application of *D. regia* for various ailments by traditional practitioners. The study revealed specific identities for the particular crude drug which will be useful in identification and control to adulterations of the raw drug.

Keywords: *Delonix regia*, physicochemical analysis, extraction techniques, phytochemical screening

Introduction

Since the primitive age nature has been an enormous source of medicinal agents. Plants have served as the richest source of raw materials for traditional as well as modern medicine [1-2]. The medicinal value of plants is mainly due to the presence of phytochemicals. They are basically plant metabolites, are synthesized in all part of plant body by itself and have some definite physiological action on animals [3-6].

The plant *Delonix regia* belongs to family Fabaceae, sub-family Caesalpinioideae. It is a tree (10-15 m high, girth of upto 2 m) with many branches and umbrella shaped crown. It has biparinnate, alternate, light green, feathery leaves, 10-25 pairs of pinnae, each having 12-40 pairs of small leaflets. Near the end of the twig are present 15-30 cm long corymbs, which are borne laterally, each having loosely arranged slightly fragrant orange-red flowers, which literally cover the tree from April to June. Petals (5-6.5 cm, 2-3 cm wide) are broadly spoon shaped. The tree is native to Madagascar and has been widely planted for the last 150 years as a garden and avenue tree in both dry and moist regions of tropical India. It has many pharmacological activities like in-vitro antioxidant, antimicrobial, diuretic, Anti-dysentric, anti-diahorreal, and antipyretic, antifungal, antibacterial, antioxidant, antiemetic, larvicidal, hepatoprotective, anti-diarrhoeal, anti-inflammatory, antimalarial, anthelmintic, antiarthritic, wound healing and anticarcinogenic potential effects [7-11]. In the present paper, the physicochemical parameters and preliminary phytochemical screening different solvent extracts of flower of *Delonix regia* were done for identification of the drug in dry form and control the adulterants.

Materials and Methods

Collection of plant materials

The flower of *Delonix regia* was collected from Burdwan area, W.B. in the month of April' 2018. The plant materials were taxonomically identified and authenticated by Botanical Survey of India (BSI) & Central National Herbarium, Shibpur, Howrah (W.B.). A voucher specimen was also deposited.

Processing of Plant Materials

The plant Materials was cleaned and shade dried until all the water molecules evaporated and the dried plant materials (petals of flower) was taken and grinded into coarse powder

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powdered. The powdered samples were stored in a clean glassware container until needed for analysis with proper labeling.

Preliminary physicochemical characteristics:

Air dried flowers were used for quantitative determination of proximate analysis e.g. loss on drying, total ash, acid insoluble ash, alcohol soluble extractive values. These physicochemical studies were done according to standard procedure of Indian Pharmacopoeia and WHO guidelines [12-15].

Preparation of plant extracts

Solvent extraction

Crude plant extract was prepared by Soxhlet extraction method. About 20 gm of powdered plant material was uniformly packed into a thimble and extracted with 250 ml of different solvents separately. Solvents used were petroleum ether, chloroform, ethyl acetate, acetone methanol, ethanol and water as per polarity. The process of extraction continues for 24 hours or till the solvent in siphon tube of an extractor become colorless. After that the extract was taken in a beaker and kept on hot plate and heated at 30-40 °C till all the solvent got evaporated. Dried extract was kept in refrigerator at 4 °C for their future use in phytochemical analysis.

Qualitative phytochemical analysis

The extracts were tested for the presence of bioactive components by using following standard methods [16-20].

Phytochemical Screening

Test for Alkaloids (Wagner's test)

A fraction of extract was treated with 3-5 drops of Wagner's reagent (1.27 g of iodine and 2 g of potassium iodide in 100 ml of water) and observed for the formation of reddish brown precipitate (or colouration).

Test for Carbohydrates (Molisch's test)

Few drops of Molisch's reagent were added to 2 ml portion of the various extracts. This was followed by addition of 2 ml of conc. H₂SO₄ down the side of the test tube. The mixture was then allowed to stand for two-three minutes. Formation of a red or dull violet colour at the interphase of the two layers was a positive test.

Test for Cardiac glycosides (Keller Kelliani's test)

5 ml of each extract was treated with 2 ml of glacial acetic acid in a test tube and a drop of ferric chloride solution was added to it. This was carefully underlayered with 1 ml concentrated sulphuric acid. A brown ring at the interface indicated the presence of deoxysugar characteristic of cardenolides. A violet ring may appear below the ring while in the acetic acid layer, a greenish ring may form.

Test for Flavonoids (Shinoda test)

To the extract, a few magnesium turnings and a few drops of concentrated hydrochloric acid were added and boiled for five minutes. Red coloration identifies the presence of flavonoids.

Test for Phenols (Ferric chloride test)

A fraction of the extracts was treated with aqueous 5% ferric chloride and observed for formation of deep blue or black colour.

Test for Phlobatannins (Precipitate test)

Deposition of a red precipitate when 2 ml of extract was boiled with 1 ml of 1% aqueous hydrochloric acid was taken as evidence for the presence of phlobatannins.

Test for Amino acids and Proteins (1% ninhydrin solution in acetone).

2 ml of filtrate was treated with 2-5 drops of ninhydrin solution placed in a boiling water bath for 1-2 minutes and observed for the formation of purple colour.

Test for Saponins (Foam test)

To 2 ml of extract was added 6ml of water in a test tube. The mixture was shaken vigorously and observed for the formation of persistent foam that confirms the presence of saponins.

Test for Sterols (Liebermann-Burchard test)

1 ml of extract was treated with drops of chloroform, acetic anhydride and conc. H₂SO₄ and observed for the formation of dark pink or red colour.

Test for Tannins (Braymer's test)

2 ml of extract was treated with 10% alcoholic ferric chloride solution and observed for formation of blue or greenish colour solution.

Test for Terpenoids (Salkowki's test)

1 ml of chloroform was added to 2 ml of each extract followed by a few drops of concentrated sulphuric acid. A reddish brown precipitate produced immediately indicated the presence of terpenoids.

Test for Quinones

A small amount of extract was treated with concentrated HCl and observed for the formation of yellow precipitate (or colouration).

Test for Oxalate

To 3 ml portion of extracts were added a few drops of ethanoic acid glacial. A greenish black colouration indicates presence of oxalates.

Results and Discussion

Results obtained for quantitative determination of proximate analysis and qualitative screening of phytochemicals in flower of *D. regia* are presented in Table 1 & 2. Total fourteen phytochemicals were screened in which eleven were present in different solvent extracts. They are cardiac glycosides, flavonoids, phenols, carbohydrates, saponins, tannins, alkaloids, phlobatannins and terpenoids. Remarkably, carbohydrate flavonoids, phenols, saponins, tannin, quinones, alkaloids and terpenoids were present in the flower of these plants. This suggests that the flowers have extensive potentials of phytochemicals.

Physiochemical parameters of the flower of *Delonix regia* are tabulated in Table 1. Different extracts of the powdered flower were prepared for the study of extractive values. Percentage of extractive values was calculated with reference to the air dried drug. The results are shown in Table 1. Deterioration time of the plant material depends upon the amount of water present in plant material. If the water content is high, the plant material can be easily deteriorated due to fungus. The loss on drying at 105 °C in flower was found to be 10.1%. Total cash value of plant material indicated the

amount of minerals and earthy materials attached to the plant material. Analytical results showed total ash value content was 6.55%. The negligible amount of acid insoluble siliceous matter present in the plant was 4.54%. The alcohol soluble extractive values indicated the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids.

In these screening process alkaloids, tannins, saponins, flavonoids and terpenoids, glycosides, phenols shows different types of results in different solvents. From the flower, water extract showed the presence of carbohydrate, alkaloids, saponins and tannins. However, 70% ethanol and acetone had the presence cardiac glycosides, carbohydrates, flavonoids, phenols, saponins, proteins, alkaloids and terpenoids. The methanol extract had the presence of cardiac glycosides, carbohydrate, alkaloids, flavonoids, phenol, tannins, saponins and terpenoids.

The medicinal value of plants means definite physiological

action on the human body due to presence chemical substances. Different phytochemicals have been found to possess a wide range of activities, which may help in protection against diseases. Alkaloids protect against chronic diseases. Saponins protect against hypercholesterolemia and antibiotic properties. Steroids and triterpenoids show the analgesic for central nervous system activities [21].

Table 1: Physicochemical analysis of flower of *Delonex regia*

S.N.	Parameters	Results (% w/w)
1	Total Ash	5.56
2	Acid insoluble Ash	4.20
3	Water insoluble Ash	1.84
4	Water soluble extractive value	10.63
5	Alcohol soluble extractive value	4.48
6	Loss on Drying	8.61

Table 2: Result of phytochemical evaluation of flower of *Delonex regia*

S.N.	Phytochemicals/ Solvent Extracts	Pet. Ether	Chloroform	Ethyl acetate	Acetone	Ethanol	Methanol	Water
1	Alkaloids	-	-	-	-	+	-	+
2	Cardiac Glycosides	-	+	-	+	+	+	-
3	Carbohydrates	+	+	+	+	+	+	+
4	Flavonoids	-	+	+	+	+	+	-
5	Phenols	-	+	+	+	+	+	-
6	Phlobatannins	-	-	+	-	+	+	-
7	Proteins	-	-	-	-	-	-	-
8	Saponins	+	+	-	-	-	-	+
9	Sterols	-	-	-	-	-	-	-
10	Tannins	-	-	-	+	+	-	-
11	Curcumin	-	-	-	-	-	-	-
12	Terpenoids	-	+	+	+	+	+	-
13	Quinones	+	+	+	+	+	+	+
14	Oxalates	-	-	-	-	-	-	-

+ = present; - = absent.

The result indicates that *Delonex regia* flower hold promises as source of pharmaceutically important phytochemicals. Flavonoids generally present in areal parts like flowers play some metabolic role and control development in living system. Tannins are known to inhibit pathogenic fungi. The flavonoids and phenolic compounds in plant have been reported to exert multiple biological effects including antioxidant, free radical scavenging abilities, anti-inflammatory, anti-carcinogenic, astringent, cytotoxicity, anti-diabetic, cardiotoxic, antipyretic effects etc. [22].

Conclusion

Evaluation of drug means confirmation of its identity and determination of its quality, purity and detection of the nature of adulteration. Proximate analysis is useful in determining authenticity and purity of sample and also these values are important qualitative standards. The screening of a crude drug is necessary for biochemical variation in the drug, deterioration due to treatment and storage and substitution and adulteration. Preliminary Phytochemical screening is a part of chemical evaluation. The qualitative chemical test is useful in detection of adulteration. Phytochemicals found in flower extracts of *Delonex regia* indicates their potentiality as a supply herbal medicine. The results from the ash value, acid insoluble ash and water soluble ash values suggested that the flower contains demonstrable quantity of inorganic salts. The phytochemical characterization of the extracts, the isolation of responsible bioactive compounds and their biological activity are necessary for future studies.

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