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Research Article

EVALUATION OF PHYSICOCHEMICAL AND PHYTOCHEMICAL CONSTITUETS OF *BRASSICA NIGRA* LINN.

[1]Hariharan G, [2]Agnel Arul John N, [3]Sridharan G and [4] Bhuvaneshwari C

[1,2 & 3]Asst. Professor, Srimad Andavan Arts and Science College (Autonomous), Trichy-05.
[4] Research Scholar, Srimad Andavan Arts and Science College (Autonomous), Trichy-05.

Abstract

Brassica nigra* Linn.** is a herb in ***Brassiaceae* or *Crucifera family commonly called as Black or True mustard, traditionally used for the treatment of several diseases (Bronchitis, Influenzae, Antihelmintic and skin inflammation etc). The aim of the present study was to analyze the phytochemical and Physicochemical standards of the plant powder revealed the presence of Saponin, Flavones, Alkaloids, Phenols and Tannin. The quantitative analysis of secondary metabolites reported that the plant powder contain rich amount of phenols. The result of the study could be useful for description and foundation of monograph of the plant.

1. Introduction

Medicinal plants play a key role in human health care. About 80 % of the world populations rely on the use of traditional medicines, which are predominantly based on plant materials. The traditional medicine refers to a broad range of ancient, natural health care practices including folk/tribal practices as well as Ayurveda, Siddha and Unani. These medicinal practices originated from time immemorial and developed gradually, to a large extent, by relying or based on practical experiences without significant references to modern scientific principles[1]. Medicinal plants have been used for years in daily life to treat diseases all over the world. Interest in medicinal plants reflects the recognition of the validity of many traditional claims regarding the value of natural products in healthcare[2]. Numerous useful drugs have been discovered from higher plants followed by ethno medical practices[3]. Herbal medicines are in great demand in the developed as well as developing countries for primary healthcare because of their wide biological and medicinal activities, higher safety margins and lesser costs[4].

India is one of the largest producers of herbal products. Due to increasing demand in the field of herbal medicine, it has become necessary and pertinent to probe into the area of systematic knowledge about herbal drugs[5]. Medicinal plants are believed to be an important source of new chemical entities with potential therapeutic effects[6]. Plant extracts as well as their primary and secondary metabolites have important therapeutic role in the treatment of many human diseas[7]. Plants make a significant contribution to health care due to the recognition of the value of traditional medicinal systems[8,9].

Phytochemicals are bioactive compounds found in plants that work with nutrients and dietary fiber to protect against various types of diseases. They are non-nutritive compounds. These phytochemical constituents are secondary metabolites which is present in smaller quantities in higher plants and they include the alkaloids, Steroids, flavonoids, terpenoids, tannins and many others. Medicinal plants are a rich source of numerous pharmacologically active molecules. India is a continent with wide field of diversity. Quality can be defined as the status of a drug that is determined by identity, purity, content andother chemical, physical, or biological properties, or by the manufacturing processes. For the quality control of a traditional medicine, the traditional methods areprocured and studied, and documents and the traditional information about the identity andquality assessment are interpreted in terms of modern assessment.

The present study has been undertaken to elucidate the monograph of ***Brassica nigra*** **Linn.** by analyzing its physicochemical and phytochemical standards.

2. Materials and Methods

2.1 Collection, Identification and Authentication

Plant selected for the present study was ***Brassica nigra*** **Linn.** The plant species was cultivated in Herbal Garden, Srimad Andavan Arts And Science College, Trichy. The leaves of 2 months old plant species were collected, identified with the help of Flora of Presidency of Madras[11] and authenticated with the specimen deposited at **RAPINAT Herbarium**, Department of Botany, St. Joseph's college, Trichy.

2.2 Physico Chemical Constants [13]

The Physicochemical standards such as moisture content, Total ash, Acid soluble Ash, Water soluble Ash, Extractive values, Water soluble extractive value, Hexane soluble extractive value, Chloroform soluble extractive value Alcohol soluble extractive value and Fluorescence analysis were carried out by standard textual procedures. [14]

2.3 Preliminary Phytochemical Screening of Plant Powder and Various Extracts

Preliminary phytochemical screening of various extracts and dry powder were carried out as per the standard textual procedure[15]

2.4 Quantitative Estimation of the Major Metabolites

Major secondary metabolites such as phenol[16], Total Flavonoids[17], Total Alkaloids[18], Saponin[19] and Tannin[20] were quantitatively estimated by standard textual procedures.

3. Results and Discussion

The preliminary phytochemical analysis of various extracts of ***Brassica nigra*** **Linn.** indicate the presence of various phytoconstituents such as **Saponin, Tannin, Sterol, Terpene, Flavanoid, Coumarin, Quinone, Lignin, Alkaloid, Glycosides, Sugar and Phenols (Table –)**

TABLE 1 – Preliminary Phytochemical Screening of Powder and Various Extracts of Brassica Nigra Linn.

S.No	Test for	Dry Powder	Hexane	Chloroform	Ethyl acetate	Ethanol	Water
1	Saponin	+	-	-	-	-	+
2	Tannin	+	-	-	+	+	+
3	Sterol	-	+	+	+	+	-
4	Terpene	-	-	-	-	-	-
5	Flavanoid	+	-	+	+	+	+
6	Coumarin	+	-	-	+	+	+
7	Quinone	-	-	-	-	-	-
8	Lignin	-	-	-	-	-	-
9	Alkaloid	-	-	+	+	+	+
10	Glycosides	+	-	-	+	+	+
11	Sugar	+	-	-	+	+	+
12	Phenols	+	+	+	+	+	+

Note: (-) Absence, (+) Presence

The preliminary phytochemical screening of the **dry plant powder** shows the presence of **Saponin, Tannin, Flavonoid, Coumarin, Glycosides, Sugar and Phenols**. Then various extracts Such as **Hexane extract** shows the presence of **Sterol and Phenol. Chloroform** extracts shows the

presence of **Sterol, Flavonoid, Alkaloid and Phenol. Ethylacetate extract** shows the presence of **Tannin, Sterol, Flavonoid, Coumarin, Alkaloid, Glycosides, Sugar and Phenol. Ethanol extract** shows the presence of **Tannin, Sterol, Flavonoid, Coumarin, Alkaloid, Glycosides, Sugar and Phenol. The aqueous extract** of the plant ***Brassica nigra* Linn.** shows the presence of **Saponin, Tannin, Flavonoid, Coumarin, Alkaloid, Glycosides, Sugar and Phenol (Table 1)**

TABLE 2 – Physicochemical Constants of Brassica Nigra Linn.

S.No	PARAMETERS	VALUE % W/W
1	Foreign Matter	2.16
2	Loss on Drying	1.87
3	Total Ash content	8.54
4	Water soluble Ash	5.98
5	Acid insoluble Ash	1.47

TABLE 3 – Successive Extractive Values of Brassica Nigra Linn.

S.No	PARAMETERS	VALUE % W/W
1	Hexane	2.14
2	Chloroform	5.29
3	Ethyl acetate	2.31

TABLE 4 – Solubility of Brassica Nigra Linn.

S.No	PARAMETERS	VALUE % W/W
1	Alcohol	7.45
2	Water	15.21

The presence of active chemical metabolites and its decomposition on storage dry powder of plant material is based on it moisture content during storage condition. The low value of loss on drying of dry powder of ***Brassic nigra* Linn** showed its proper storage and further indicated that the plant powder do not have any foreign particles.

From the **Table 2** it was found that the Total ash content of the plant material was 8.54 % and acid insoluble ash was found to be 1.47 %, which indicated the purity of the test drug taken under study. Ash value aids to decide quality and purity of crude drugs. Total ash, acid insoluble ash and water soluble ash % were determined. The results showed that there is a higher value of total ash and

lesser acid insoluble ash indicates the purity[21]**.** Acid insoluble ash is a part of total ash and measures the amount of silica present, especially as sand and siliceous earth. Water soluble ash is the water soluble portion of the total ash[23].

From this result, it depicted that the amount of acid soluble ash is less than that of water soluble ash, whereas the amount of total ash is higher than the quantity of water soluble ash. The ash content gives an idea about the inorganic contents of powdered leaves under investigation and thus the quality of the drugs can be assessed.

The results of physicochemical properties indicate that of ***Brassica nigra*Linn.** (leaves) have different content of moisture, total ash, acid and water soluble ash, alcohol soluble extractives and water soluble extractives **(Table 4)**. The Loss on drying and ash value were found within the normal range (Loss on drying 6 % and ash value 20 %). The water soluble extractive value was higher as compared to the alcohol extractive value.

Table 3 depicted that the hexane and chloroform extractive values were 2.14 % and 5.29 % respectively, which indicated the presence of low polar compounds such as Flavones and phenols.

Table 4 depicted that the Water solubility of plant powder was found to be higher than that of alcohol solubility. Water extractive value is significantly more when compared to other extractive values, indicates the presence of high polar compounds in selected plant[22].

TABLE 5 - Fluorescence Analysis of *Brassica Nigra Linn.*

S.No	Treatment	*Brassica nigra* Linn.					
		Day light (0 hrs)	**UV light (0 hrs)**	**Day light (24 hrs)**	**UV light (24 hrs)**	**Day Light (48 hrs)**	**UV light (48 hrs)**
1	Dry powder	Green	Green	Green	Green	Green	Dark green
2	Dry powder+aq. 1 N NaOH	Yellowish green	Light green	Green	Yellowish green	Light green	Yellowish green
3	Dry powder+alc. 1 N NaOH	Yellow	Yellowish green	Yellowish green	Yellowish green	Dark green	Yellowish green
4	Dry powder+1 N Hcl	Light yellow	Light green	Light brown	Light green	Pink	Light green
S.No	**Treatment**	***Brassica nigra* Linn.**					
		Day light (0 hrs)	**UV light (0 hrs)**	**Day light (24 hrs)**	**UV light (24 hrs)**	**Day Light (48 hrs)**	**UV light (48 hrs)**
5	Dry powder+ 50% H_2SO_4	Dark green	Brown	Dark green	Dark green	Dark green	Brown
6	Dry powder+	Green	Red	Green	Reddish	Dark	Reddish

	chloroform				orange	green	orange
7	Dry powder+ Hexane	Yellowish green	Pink	Yellowish green	Pink	Light green	Orange
8	Dry powder+ Ethyl acetate	Light green	Orange	Green	Orange	Green	Orange
9	Dry powder+acetone	Light green	Orange	Dark green	Reddish orange	Dark green	Reddish orange
10	Dry powder+Benzene	Yellowish green	Orange	Yellowish green	Orange	Light green	Orange
11	Dry powder+alcohol	Light green	Orange	Green	Orange	Dark green	Reddish orange
12	Dry powder+water	Colourless	Light green	Colourless	Light green	Colourless	Light green

Table 5 depicted the fluorescence analysis of the drug powder. The fluorescence behavior of the drug powder with the above mentioned chemicals was observed in the day light and UV light, which was found to give various shades of green, brown and yellow. The brown and yellow fluorescence indicates the presence of Alkaloids and Flavones. The green fluorescence indicates the presence of sterols.

Crude drugs are often assessed qualitatively for their fluorescence features and it is an important parameter to evaluate the nature of chemical constituents present in the plant[24]

TABLE 6 – Quantitative Analysis of Major Secondary Metabolites

S.No	Particulars	Amount (mg/g)
1	Phenol	44.2
2	Alkaloids	15.0
3	Saponin	5.75
4	Tannin	2.84
5	Flavonoids	1.25

Quantitative estimation of six important metabolites was carried out and the results were tabulated in **Table 6**. In ***Brassica nigra* Linn.** the phenol content was found to be higher when compared to alkaloids, Flavanoids, saponin and tannin. The plant drug also contain moderate amount of Alkaloid. The level of phenol was 44.2 mg/g the high amount of phenol content may attribute to the pharmacological activity as well as important in the regulation of plant growth, development and disease resistance capacity of the plant drug taken under study.

4. Conclusion

The present study has been carried out to investigate the Physicochemical and Phytochemical analysis of ***Brassica nigra* Linn.** The brown and yellow fluorescence indicates the presence of

Alkaloids and Flavones and the green fluorescence indicates presence of sterol. The physiochemical standards especially foreign matter, moisture content, total ash was determined for the selected plant which denotes the purity of the plant under study. The phytochemical analysis of the dry powder revealed the presence of **Tannin, Sterol, Flavonoid, Coumarin, Alkaloid, glycosides, sugar and Phenols**. The quantitative analysis of important secondary metabolites showed the presence of phenols (44.2 mg/g), alkaloids (15.0 mg/g), Saponin (5.75 mg/g), Tannin (2.84 mg/g) and flavones (1.25 mg/g). This phytochemical screening study indicates that rich amount of Phenol content present in the plant of ***Brassica nigra*** **Linn.** which is responsible for the versatile medicinal properties.

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