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Research Paper

Phytochemical and Pharmacognostic study of *Piper nigrum* (Black Pepper)

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Black pepper (*Piper nigrum*) is a flowering vine in the family Piperaceae, cultivated for its fruit, which is usually dried and used as a spice and seasoning. Piper species are of great medicinal values in India. Chemical compounds in plants mediate their effect on the human body through processes identical to those already well understood for the chemical compounds in conventional drugs; thus herbal medicines do not differ greatly from conventional drugs in terms of how they work. This enables herbal medicines to have beneficial pharmacology, but also gives them the same potential as conventional pharmaceutical drugs to cause harmful side effects. The current study provides Pharmacognostic, Phytochemical, Physiochemical and Chromatographic details about Piper species namely *Piper nigrum*. This study will provide complete information about Macroscopy, Microscopy and Correct Identification of Plant.

Keywords: *Piper nigrum*, Pharmacognostic, Chromatography, Identification.

INTRODUCTION

Medicinal plants have been identified and used throughout human history. Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions, and to defend against attack from predators such as insect fungi and herbivorous mammals. At least 12,000 such compounds have been isolated so far; a number estimated to be less than 10% of the total (1). Chemical compounds in plants mediate their effect on the human body through processes identical to those already well understood for the chemical compounds in conventional drugs; thus herbal medicines do not differ greatly from

conventional drugs in terms of how they work. This enables herbal medicines to have beneficial pharmacology, but also gives them the same potential as conventional pharmaceutical drugs to cause harmful side effect (2,3).

The current study reveals Pharmacognostic, Phytochemical, Physiochemical and Chromatographic details about Piper species namely *Piper nigrum*. **Black pepper** (*Piper nigrum*) is a flowering vine in the family - Piperaceae, cultivated for its fruit, which is usually dried and used as a spice and seasoning. When dried, the fruit is known as a peppercorn. When fresh and fully mature, it is approximately 5

millimetres (0.20 in) in diameter, dark red, and drupes, like all, contains a single seed.

Scientific classification of the plant (4)

Kingdom	Plantae
Division	Angiospermae
Class	Dicotyledons
Order	Piperales
Family	Piperaceae
Genus	<i>Piper nigrum</i> Linn.
Species	<i>Piper trioicum</i> , <i>Piper baccatum</i>
Synonyms	<i>Muldera multinervis</i> ,
Common names	Kalimirch

Varieties

There are two varieties viz. Black and white varieties (procedure and un-procedure) available at present.

- **BLACK PEPPER:**

Black pepper is produced from the green unripe drupe(unripe fruit) of the pepper plant. The unripe fruits are cooked in water for a few hours, sun dried or machine- dried for many days during which pepper gains black wrinkled skin. Then it is called black peppercorn. Some people dry the unripe fruit without boiling it. Such black peppercorn can be used to extract essential oil medicines.

- **GREEN PEPPER:**

Is produced from green unripe fruit, wherein, it is not dried with heat exposure. It is freeze-dried or

using sulphur dioxide.

- **WHITE PEPPER:**

White pepper consists of the seed of the pepper fruit. The dark coloured skin is removed from it.

- **ORANGE PEPPER:**

Are prepared from ripe pepper fruit, preserved in vinegar.



Fig 1: Different varieties of Piper fruits

Chemical Constituents - Piperine, piperidine, caryophyllene, B- alanine, I-Phellandrone.

Macroscopic Characters:

The colour of drug is blackish-brown or greyish-black. It is aromatic and pungent. The berries are 3.5-6 mm in diameter; globular, and coarsely reticulately wrinkled with remains of stigma at apex. The pericarp is thin with a single white kernel. The kernel is hollow at the centre, entirely consisting of perisperm and a small endosperm and embryo.

Microscopic Characters:

The transverse section of drug show tubular epidermal cells, followed by thin walled



parenchymatous hypodermis with rectangular stone cells. The inner pericarp layer is brown coloured and is made up of sclerenchyma. Seed coat layer is attached to it and is reddish-brown. Pericarp and perisperm contain oil glands and abundant starch are also present.

Uses

The fruits as used as a aromatic, stimulant, stomachic and carminative. It is causes feeling of warmth and used as condiment. It also stimulant taste-buds, with increase in gastric juices. The oil is mainly used as due to pungent taste. It is reported to enhance the bio-availability of certain drugs.

Substitutes:

Piper attenuatum is found in Vishakhapatnam district of Andhra Pradesh and Madurai and Tirunneveli district of Tamil Nadu.

Piper brachystachyum is found in Tirunneveli and Nilgiri district of Tamil Nadu (5,6).

Material and Methods

Fresh fruits of *Piper nigrum* for the proposed study were collected from the foothill of Dehradun in the month of March 2016 . The plants was identified and authenticated by Dr. Chhaya Singh, Assistant professor, Division of life science, S.G.R.R.ITS, Patelnagar, Dehradun.. A herbarium was preserved in the department for further reference. The fruit were separated dried, coarsely powdered passed through sieve

no 40 and stored in a closed container for further use. All reagent used were of analytical grade obtained from S.G.R.R.ITS pharmacy department laboratory.

Dried fruits were used for pharmacognostic evaluation and some preliminary Phytochemical tests. The dried fruit were powdered and passed through sieve no 40. Powder of dried was used for the observation of powder microscopic characters(7,8).

Physiochemical constant ,phytochemical analysis and chromatographic studies were carried out from dried fruit powder following prescribed methods (9,10,11). TLC studies were carried out on silica gel plates .Extract for TLC was prepared by extracting 2g drug powder in ethanol by heating on water bath for 1 hour .It was filtered and concentrated to 1-2ml which was further used for TLC study. Sample were spotted on TLC using Toluene-Ethyl acetate (8:2) as mobile phase. TLC plates were observed under UV chamber(12). Powder samples were subjected to physiochemical analysis including alcohol soluble extractive, total ash, acid insoluble ash, water soluble ash and loss on drying.

Phytochemical Study:

The Phytochemical studies were performed for testing different chemical groups present in extracts.

TEST FOR CARBOHYDRATES

Molisch test:

It consist of treating the compounds of naphthol and conc. sulphuric acid along the sides of the test tube. Purple colour or reddish violet colour was produced at the junction between two liquid.

Fehling test: Equal quantity of Fehling solution A and B is added. Heat gently, red precipitate was obtained.

Test for Alkaloid:

Dragendroff test:

To the extract add 1ml of Dragendroff reagent orange red precipitate was produced.

Mayers test:

To the extract add 1ml or 2ml of Mayer reagent. Dull white precipitate was produced.

TEST FOR GLYCOSIDES:

Baljet test:

To the drug sample sodium picrate solution is added. Yellow to orange colour was produced.

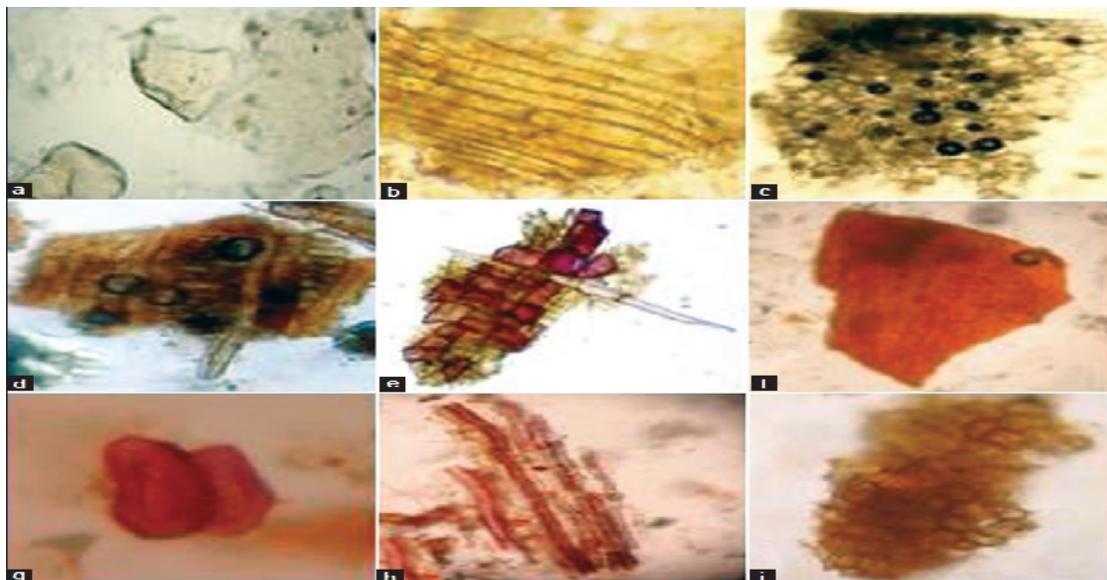
Borntrager test:

Add a few ml of dilute sulphuric acid to the test solution. Boil, filtered and extract the filtrate with ether or chloroform. Then organic layer is separated to which ammonia is added , pink, orange, red coloured was produced in organic layer.

TEST FOR SAPONIN:

Foam test:

About 1ml of alcoholic sample is diluted separately with distilled water to 20ml and shaken in graduated cylinder 15 min. 1cm layer of foam indicates the presence of saponin.



blue colour develops indicating the presence of protein, peptide or amino acid

Test for protein and amino acid:

Ninhydrin test:

Add 2 drop of freshly prepared 0.2% ninhydrin reagent to the extract and heat . A

Test for Tannins:

Ferric chloride test: To 1-2 ml of ethanolic extract, few drop of 5% w/v FeCl₃ solution were added appearance of green colour the presence of gallotannins , while brown colour indicated the presence of pseudotannins (13,14).

RESULTS

PIPER NIGRUM

Macroscopy :

Colour - Blackish-brown or greyish-black.

Odour – Aromatic

Taste – Pungent

Shape – 3.5-6mm in diameter

Size – Globular, and coarsely reticulately wrinkled

.Microscopy :

The transverse section of drug show tubular epidermal cells, followed by thin walled parenchymatous hypodermis with rectangular stone cells. The inner pericarpic layer is brown coloured and is made up of sclerenchyma. Seed coat layer is attached to it and is reddish-brown. Pericarp and perisperm contain oil glands and abundant starch are also present.

Powder Microscopy :

The powder of fruit is dark brown in colour pungent and heating in taste . the microscopical

Table 1: Physicochemical Parameters Of Piper Species

Parameters	Results
Total ash	4.45% w/w
Acid insoluble ash	0.45% w/w
Loss and drying	3.45% w/w
Alcohol soluble extractive value	10.02%/w/w
Water soluble extractive value	25.04%/w/w

Table 2: Phytochemical Parameters of Piper Nigrum

Phytochemical	Alcohol soluble Extract	Water soluble extract
Alkaloids	+	+
Carbohydrates	+	+
Proteins	+	+
Amino acids	+	+
Glycosides	-	-
Saponin	+	-
Tannins	+	+
Steroids	-	-
Phenols	+	+
Flavonoids	+	-
Coumarin	+	+
Essential oil	+	+

Table 3: TLC Analysis of Piper Nigrum

Condition	Standard piperine Rf value	Piper nigrum Rf value
UV 254 nm	0.43	0.42
UV 254nm	0.43	0.40
UV 254nm	0.43	0.6

study of powder show fragments of parenchyma, oval to elongated stone cells . oil globules and round to oval, starch grains, measuring 3 to 8 micrometer in diameter , vessels , fibres(15).

CONCLUSION

In the present study, powdered dried fruit of



Piper nigrum plant were subjected to extraction using maceration to obtain to aqueous extract and hot continuous percolation methods by soxhlet apparatus to get ethanolic extracts by the quantity of drugs.

Then, these extracts were subjected to preliminary phytochemical screening tests for presence of various phytoconstituents and results were tabulated. It revealed that the aerial parts of this plants contained alkaloids, tannins, carbohydrates, proteins, resins, flavonoids, saponins, fats and oils. Aqueous extracts contained glycosides, saponins, triterpenoid, flavonoids.

Pharmacognostical study was also performed for this drug which shows total ash values as 4.45%w/w, total acid insoluble value as 0.45% w/w, LOD as 3.45%w/w , etc.

The powder of fruits are dark brown in colour pungent and heating in taste. The microscopical study of powder shows fragments of parenchyma, oval to elongated stone cells. Oil globules and round to oval, starch grains , measuring 3 to 8 micrometer in diameter, vessels fibers.

The TLC analysis of piperine was done using standard piperine and the isolated piperine by Soxhlet extraction. Hence, Rf values of both standard and sample were isolated and compared.

The current study will serve to become a ready reference for identification and standardization of *Piper nigrum* on the basis of microscopy and chemical analysis. The preliminary photochemical investigation will further help in isolation of important compounds in future.

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