

RESEARCH ARTICLE

Seed surface characteristics and preliminary phytochemical analysis of *Celastrus paniculata* Willd

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ABSTRACT

The ancient medicine was known as herbal medicines. India is considered to be leading exporter of the medicinal plants in the world market. Plants play a very important role in preparation of herbal drugs, medicines etc. Herbal drugs play an important role in health care system. Each and every part of the plant having its specific use. *Celastrus paniculata* Willd. is one of the medicinal plant having its importance in health care system as a indigenous medicinal plant also. Every part is medicinally important but seeds of *Celastrus paniculata* Willd. having its specific use. Here we have studied the seed coat pattern i.e, seed morphology, seed anatomy and preliminary phytochemical analysis of seed powder. In seed morphology, the scanning electron microscopy detect the prominent hard rugae, uniform cell pattern with elevations. The transverse section of seed coat shows ovular section with outer epidermis wavy, palisade tissue compactly arranged in between them. Parenchymatous cells elongated isodiametric with intercellular spaces and tanniferous cells with well-developed endosperm. In preliminary phytochemical analysis the three-extract ethanol, petroleum ether and aqueous extract gives alkaloids, sterols and terpenoids, tannins are detected. Phenolic compounds, mucilage and gums, anthraquinone is absent. This seed coat study is essential for micromorphological observations, seed identification, taxonomic identification in between species to species and secondary metabolites present inside the seeds are well defined by using phytochemical technique for their therapeutic efficacy which is beneficial in health care system, economically and in society.

Keywords: *Celastrus paniculata* Willd., seed morphology, SEM (Scanning electron microscopy), seed anatomy, preliminary phytochemical analysis.

INTRODUCTION

Plant served for the purpose of food, fodder, shelter and medicines from the ancient period. The ancient medicine was known as herbal medicines. Plants play a very important role in preparation of drugs, medicines. Various organs of the plant body having its specific use and also medicinally important. So, each and every parameter of the plants like

size, shape, surface, colour, height etc. are very important for the plant study. Many of the traditional medicine are complex mixture of different plants parts that are collected at proper intervals, mixed in specific proportions and administered in definite doses for required period of time. India being a rich repository of medicinal plants has been a major supply in the world market till 1976. Now a days, India is considered to be leading exporter of the medicinal plants in the world market.

Celastrus paniculatus is a deciduous climbing shrub that can grow very large in size. *Celastrus* is prized by native peoples throughout India for its seeds, which grow in round pods that gradually change from a light yellow to a deep red colour as they mature. Seeds are probably more valuable than any other part of the plant for man and plant (Kozlowski and Gunn 1972). Seeds also constitute an important source in ethnomedicinal formulations and have a tremendous potential for pharmaceutical industry. The seeds are small, oval shaped and grow six per seed pod. It is native to the Indian continent but also grow widely in various countries (Cleversley, 2002).

The whole plants or plant parts contains number of chemical constituents the chief being alkaloids, glycosides, minerals crystals such as calcium oxalate, calcium carbonate, silica as well as tannins, resins, latex, volatile oils etc. seed powder used for various medicinal preparation as drugs. The seeds being a complex organ of multiple origin and metabolically most active that secretes and synthesizes efficient compounds that can be exploited for drug formulations. They are also endowed with definite morphological and structural pattern along with unique ornamentations. The morphological and anatomical seed surface study also important for identification and study of micromorphological characteristics. For detection of seed surface characteristics, chemical constituent, medicinal value this study is very important.

MATERIALS AND METHODS

Sample collection: Seeds of family Celastraceae like *Celastrus paniculata* Willd. were collected from local area. For seed coat study, all the seeds parameters were studied using dissecting and binocular microscope. Digital weighing balance was used for

weighing the seeds in mg. The morphological observations of seeds were done followed by their photography, using 1 cm. scale.

Seed coat morphology (SEM)

To study the seed coat morphology scanning electron microscopy is most important. For this purpose, the individual seeds were dipped in alcohol for 5-10 min. to remove the dust from them. The seed mounted on pin type stubs using double sided adhesive tape or conductive silver paint to prevent charging of the surface during scanning and then coated with a very thin layer of gold in a polaron sputter coating unit. For spermoderm study of seed photomicrograph were taken in the scanning electron microscope (SEM) (LEO 430) at Birbal Sahani Institute of paleobotany, Lucknow.

Seed coat anatomy

For the anatomical observation of seed coat study take the transverse sections of seed coat. Using permanent slide preparation method or double staining method place the section on various alcohol grade like 30%,50%,70%,90% absolute alcohol, xylene, DPX etc. The staining like safranin and light green stain used for staining.

Preliminary phytochemical tests

The preliminary phytochemical analysis is most important for detection of various chemical constituents. Trease and Evans (1989) test were done. Qualitative phytochemical analysis of the crude powder of the seeds of the plant for the identification of phytochemicals like alkaloids, carbohydrates, reducing sugars, steroids, glycosides, flavonoides, terpenoides, saponine, protein, tannins, amino acids, volatile oil or essential oil. Preliminary phytochemical test was done using different extract.

For Alkaloids: Mayer's reagent, Dragandroff's reagent, Wagner's reagent, Hager's reagent test.

For Carbohydrates: Molisch's test, Benedict's test, Barfoed's test, Fehling's solution test.

For Glycosides: Legal test, H₂SO₄ test, Borntrager's test, Killer-Killani test.

For Proteins and Amino acids: Millon's reagent, Ninhydrin reagent test, Biuret test.

For Sterols and Triterpenoids: Libermann test, Salkowski test, Noller test.

For Phenolic compounds: FeCl₃ test, Zinc-Hydrochloride reduction test.

For Flavonoids : Shinoda test, Zinc-Hydrochloride test, alkaline reagent test.

For Tannins : FeCl₃ test, Vanillin-Hydrochloride test, alkaline reagent test, Bromine water test.

For Saponins : Froth forming test.

For Fixed Oils and fats : Spot test

For Mucilage and gums : Ruthenium red test and Water absorption test.

For Anthraquinone: Benzene and 1% NH₄ solution test.

RESULTS

Seeds of *Celastrus paniculata* Willd. shows morphological parameters such as seed size ranges 0.36cm-0.18cm (average weight of 15 individual seeds), oval, reddish brown, 11.45mg, bilateral, hilum apical, acute/pointed, thick, scaly circular cells, cellular

reticulations. seeds are cented. The scanning electron microscopy (SEM) study shows that spermoderm pattern is irregular, at the apical region surface show prominent, hard rugae with elevations uniform cellular pattern giving an appearance of papillate ornamentations.

In anatomical study of seed coat the T.S. of seed coat shows outer epidermis wavy and composed of thick walled cells followed by 3-4 layers of parenchymatous cells. Below this zone thickened compactly arranged cells with tanniferous inclusions can be distinctly marked. This zone is followed by palisade layer composed of elongated cells separated by broad intercellular spaces followed by endosperm. The epidermal cell measures 46.52µm in length and 34.89µm in breadth. The palisade cell measures 58.15µm in length and 11.63µm in breadth.

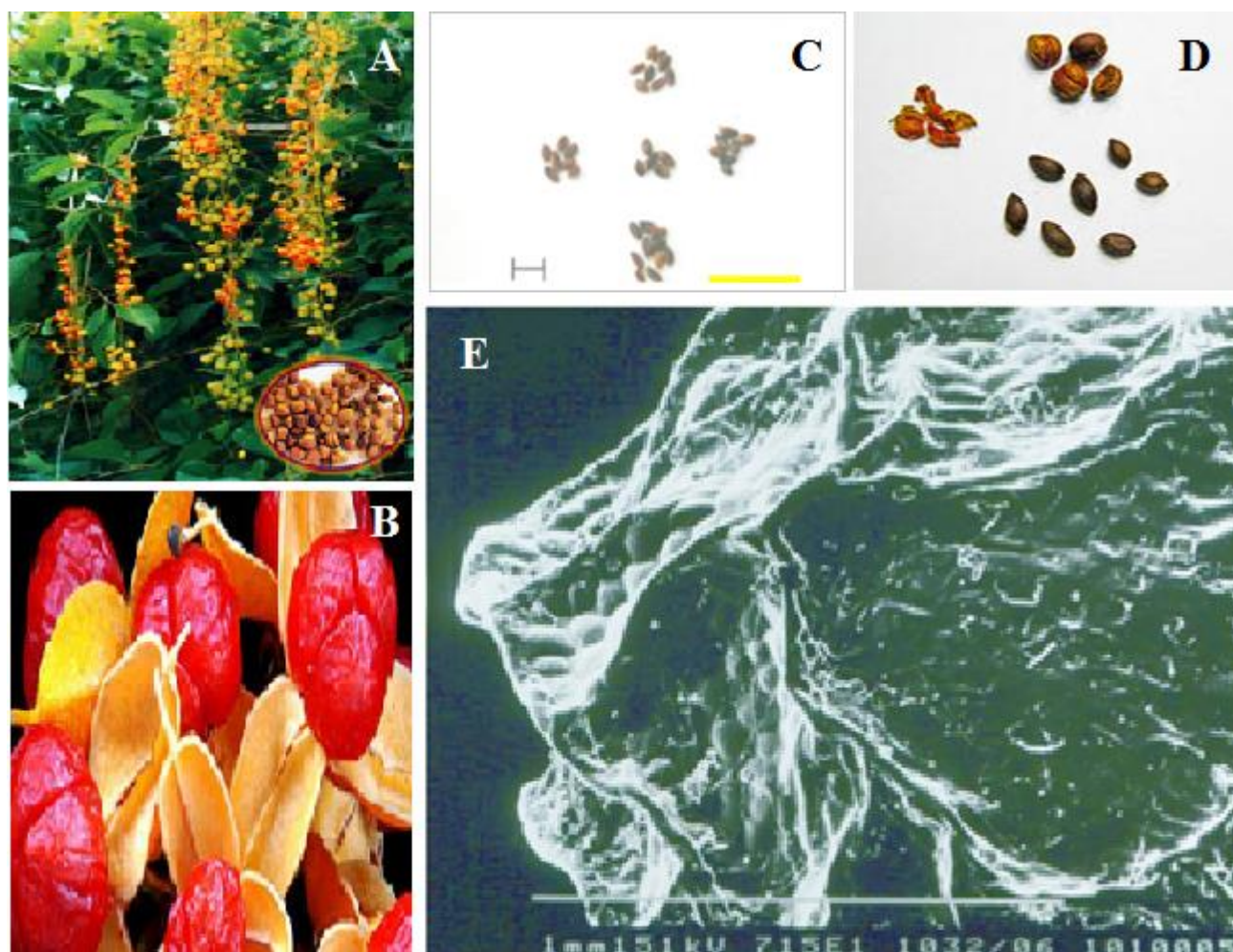


Fig:1 -A –*Celastrus paniculata* Willd. plant with seeds . **B**: *Celastrus paniculata* Willd ripe seeds. **C-D**: shows seed samples of *Celastrus paniculata* Willd. seeds are small, oval, **E**: shows whole SEM photograph of seed showing irregular surface with rugae elevations, hard edges, mounded cellular pattern.(7.15×10¹)

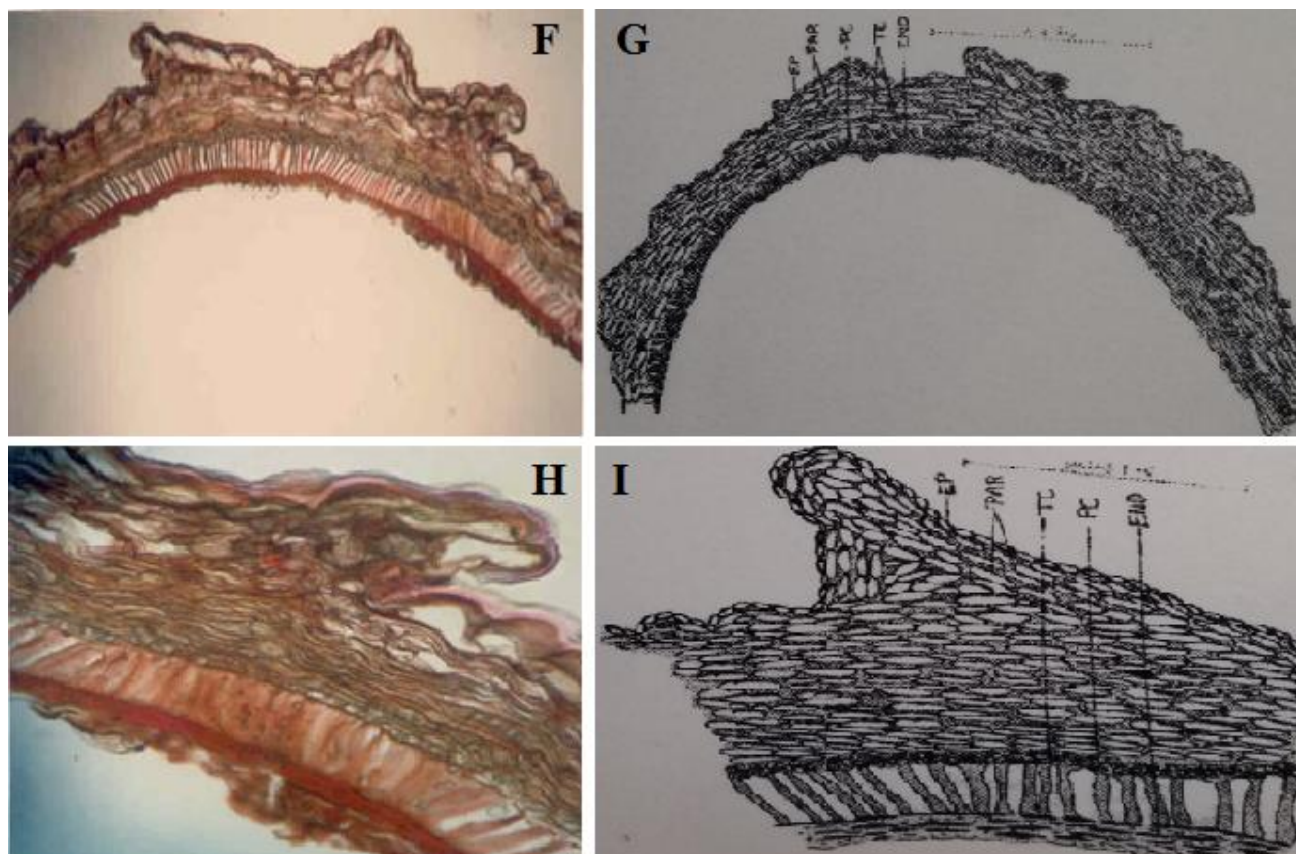


Fig 2 : **F:** *Celastrus paniculata* Willd.(160x), **G:** *Celastrus paniculata*Willd.(640x) **H:** well ornamented wavy epidermis, parenchymatous cells x 100, **I :** wavy epidermis, isodiametric parenchymatous cells ,palisade and well developed endosperm with tannin cells x 400

Table 1 : Shows preliminary phytochemical observations of seed powdered of *Celastrus paniculata* Willd

Sr no.	Chemical constituents	Ethanol	Petroleum ether	Aqueous extract
01	Alkaloids	+	+	+
02	Carbohydrates	-	+	+
03	Glycosides	-	+	+
04	Protein and amino acids	+	-	-
05	Sterols and terpenoids	+	+	+
06	Phenolic compounds	-	-	-
07	Flavonoids	-	-	+
08	Tannins	+	+	+
09	Saponins	-	+	+
10	Fixed oil and fats	-	+	+
11	Mucilage and gums	-	-	-
12	Anthraquinone	-	-	-

The preliminary phytochemical observations of seed powdered of *Celastrus paniculata* Willd. shows various chemical constituents which is present inside the seeds. The qualitative analysis is important for present study.

For preliminary phytochemical analysis, we use seed powder (using soxhlet apparatus method) which is

treated with various chemicals. For this detection, we use three extracts like ethanol, petroleum ether and aqueous extract. All the three extracts detect various chemical constituents present in it. From the above observations, all the three extracts detect the alkaloids, sterols and terpenoids, tannins etc. Carbohydrates, glycosides, saponins, fixed oils and fats are present in petroleum ether and aqueous extract.



Fig. 3: Shows *Celastrus paniculata* Willd. Habit, morphology with inflorescence, fruit, seeds and seed oil.

Phenolic compounds, mucilage and gums, anthroquinone are absent in all the three extracts. Protein and amino acids only in ethanol absent in other extract.

MEDICINAL USES

Seeds having medicinal property. This property is due to presence of secondary metabolites like alkaloids or tannins or phenolics or flavonoids as active constituents. Seed are extensively used against rheumatism, gout, paralysis and leprosy. The seed are bitter, laxative, emetic and tonic (Kapoor 1990). Seeds having good smell. It is also used as alterative stimulant and nervine tonic. Externally the oil is rubefacient (Narayanrao, 2003). Seed oil use as a component of formulation 'Mental syrup' for memory enhancing and mental disorders, improve memory (Kalaskar, 2012).

DISCUSSION

From the above observations, it is clear that the seed coat study and phytochemical analysis of seeds of *Celastrus paniculata* Willd. focus on various aspects related to morphological, anatomical and phytochemical constituents inside the seeds. From all

the parts seeds is the highest useful part which is economically, medicinally and other beneficial purposes. The present study helps for the plant identification and taxonomic information. The surface shows uniform cellular pattern with elevations which determine morphological view while anatomical seed coat study gives detailed about cellular pattern well develop wavy, ornamented epidermis, parenchymatous cells with palisade layers and well-developed endosperm. This study clears the anatomical cellular pattern of seed coat.

The preliminary phytochemical analysis essential for study of medicinal property because it contains various secondary metabolites. This study detects various chemical constituents which helps for preparations of drugs. It also included in indigenous herbal medicine. In Ayurveda, this study is most important. Recently, ongoing research on seed oil of *Celastrus paniculata* Willd. pristimerin derived from seed used as a anticancer drugs. It is inhibiting the growth of specific types of cancer cell. (Yang *et al.* 2008) Seed oil is used on various diseases. So extraction, detection and analysis is important. It is a nutrient rich oil that the active compound are found. Such as celastrin, paniculatin and other active alkaloids. It is also used for improving memory, retention and recall, mental activity (Cleversley, 2002).

From the above observations it is clear that the morphological study of seedcoat clear the surface view, the anatomical seedcoat study clear the internal cellular structure. The micromorphological characters helps for taxonomic identification also. The preliminary phytochemical analysis detects various chemical constituents which is use for preparation of various drugs. Seed oil is used on various purposes. So, seeds give potential health benefits. Various brain problems, diseases it is use on large quantity. It is use in medicinal industry in large quantity for preparation of various drugs. In Ayurvedic treatment oil is used as a medicine. So, seeds are in large quantity used and showing their threptic efficacy. Economically and in various pharmaceutical and medicinal industry it is very important and also gives benefits in the society.

Conflicts of interest: The authors stated that no conflicts of interest.

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