Original Research Paper

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Coffeocarpon Deccanii Gen. Et. Sp. Nov. A New Petrified Dicotyledonous Berry Fruit from the Deccan Intertrappean Beds of Central India

Botany

KEYWORDS : Dicotyledonous , Fossil fruit, berry, Rubiacae , Intertrappean beds, Mohgaonkalan , M.P.

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ABSTRACT

The fossil cherts were collected from Central India. A well known fossiliferous locality belonging uppermost cretaceous period. The present fossil fruit is small, fleshy, dicotyledonous, bilocular, berry (bean). The fruit wall is differentiated into three zones. The outer most thick walled epicarp and middle thin walled mesocarp and innermost thick walled endocarp. The seed is unitegmic, endospermous with central cavity. The fruit is compared with the fruits of dicotyledonous families having bilocular ,two seeded and small fleshy fruits

INTRODUCTION

Mohgaonkalan, M.P. India, well known fossiliferous locality belonging to uppermost cretaceous period. There are many different type of fruits reported from Mohgaonkalan M.P. India. But some of very few berry types of fruits of dicotyledons and monocotyledons are reported these are – *Mohgaoncarpon eydei* (Yawale, 1977), *Kremocarpon indicum* (Upadhye and patil 1978), *Erythroxyloarpon intertrappea* (Khubalkar, 1982) and *Kremocarpon aquatica* (Kate. 1974)

MATERIAL AND METHOD

The fossiliferous cherts material was collectced from the fossiliferous locality Mohagaonkalan M.P. India. A fossiliferous chert on breaking exposed the persent fruit in oblique longitudinal plane. After etching the cherts with hydrofluoric acid, serial peel sections along the longitudinal plane were taken for the investigation of the fruit. The slides of the material were prepared to study the anatomical details.

DESCRIPTION

The present fossil is bilocular petrified berry fruit. The persent specimen is well preserved in fossiliferous chert. Fruit is small fleshy, globose, circular in shape in transverse plane. It is 1.56 mm in size. (Text fig. 1-4 , Plate fig 1-2) . It is dicotyledonous, berry fruit. The pericarp of fruit is divided into epicarp, mesocarp and endocarp.

Pericarp (fruit wall)

The pericarp in present fossil fruit is well preserved measuring 8 µ in thickness. It is thick and divided into epicarp, mesocarp and endocarp.(Text fig 3, Plate fig. 7) .The stalk of fruit was not observed well.

Epicarp

Epicarp is outermost single layer of the berry fruit. It is formed by a single layer of compact parenchyma cells, smooth in nature or pulpy. Epicarp measures in thickness 58.2 µ. Each cell in epicarp measures 7.98 µ thickness and 5.32 µ in breadth.(Text fig 7 ,Plate fig 3).

Mesocarp

Mesocarp is massive and also referred to as the mucilage, is the flesh of the berry fossil fruit. While pulp can sometimes refer to solely the mesocarp the term usually used as a combination of the epicarp and part of the mesocarp removed during pulping. Mesocarp consists of thin walled parenchymatous tissue in the presnt fossil fruit. These cells are oval in shape and compactly arranged and each cell measures 0.266 µ x 0.273 µ in size. (TextFig 7, Plate fig 4). Which might be edible part of fruit. The fibrous tissue and fibro-vascular bundles are not seen.

Endocarp

The endocarp or parchment is the innermost layer of the pericarp and is the hull that envelops the bean. It is formed of 3-5 layers of sclerenchyma cells (fibrous cell the serve as the principal support cells in plants). It is hard and stony in nature measuring 53.2 µ x 39.9 µ in thickness. (Text fig. 9,Plate fig 7) The cells of endocarp harden during fruit maturation. Thus limiting the final size of the seed or bean.

Seed

The seed or bean, comprises a thin skin, an endosperm and an embryo. Embryo is not well preserved in present fossil fruit.

Seed Coat

The thin skin also called the perisperm or spermoderm is the outermost layer that wraps the seed. It is formed from the nucellus, or central portion of the ovule. Spermoderm is consisting of very thin walled rectangular parenchyma cells. Each cell measures 0.931 µ in thickness and 0.13 µ in width. (Text fig 10, Plate fig6)

Endosperm

Endosperm is the largest part of fossil fruit berry. Endosperm is the principal reserve tissue of the seed might be edible part of fruit and is composed of only one type of tissue, tissue of endoperm measuring in 127.68 µ thickness. The tissue of endoperm measuring in 56.60 µ thickness. (Text fig .9, Plate fig 5,6)

IDENTIFICATION AND DISCUSSION

The structural features are observed in present fossil fruit is fleshy with mucilage massive, single seeded, circular in shape fruit wall is smooth plane preicarp.Pericarp is divided into outer epicarp consisting thick walled cells, the middle mesocarp of thin walled parenchymatous tissue and the innermost stony endocarp.Embryo has not observed clearly.

Discussion

The characteristic features of the described fruit of identification are –

Fossil berry fruit is spherical in shape, globose and fleshy in nature.

Fruit is broadly divided into fruit wall that is pericarp (Epicarp, Mesocarp, Endocarp) and seed with seed coat.

Epicarp is made up of thin walled parenchymatous cells and the seed is well preserved.

Endosperm is the largest part of fossil fruit berry.

Interesting features about fruit is endosprem is the principal reserve tissue of the seed might be edible part of fruit.

From the above features it confirms as fossil specimens in berry like fruit with pericarrp and parenchymatous tissue in central part. The fruit shows various degrees of resemblances to some families have berry fruits. These familes are Verbenaceae, Rutaceae, Violaceae, Cactaceae, Rubiaceae, Sapotaceae, Musaceae and Solanaceae out of this present fossil fruit shown resemblances with family Rubiaceae in many aspects.

COMPARISON
Comparison with Modern families

In family Verbenaceae, the fruits either berry or drupe : ovary 2/4 locular with 1-2 ovules in each locule fruit is usually a drupe, which in not seen in present fruit.

When family Rutaceae is compared with present fossil fruit it shows similarities in fruit which is usually berry but differs in number of ovules they are one to many.

Family Vitaceae shows similarities in having fruit with 1-6 chambered berry 1-2 seeds in each chamber.

In family Cactaceae placentation is parietal bearing numerous ovules while in present fossil fruit placentation is axile, hence it is different.

In family Sapotaceae fruit is having 1-8 locular berry with ovule in each locule. Which is different from present fossil fruit.

Musaceae family shown similarities in fruit type i.e. berry, but differs in having tricarpellary, trilocular nature with many ovules in each locule.

Solanaceae family shows similarities in fruit type i.e. berry, but differs in having bilocular in transverse section of fossil fruit.

In family Rubiaceae berry fruit with axile placentation. The present fossil fruit shows close resemblances with family Rubiaceae which has berry fruit and some specimen shows axile placentation.

Hence, from the above described characters structure of present fossil fruit should be close to the family Rubiaceae. Therefore, this fruit is being assigned to the family Rubiaceae.

Comparison with fossil fruits
The structure of present fossil fruit is also compared with already reported fossil berry fruits.

Kremocarpon aquatica (Kate, 1974, Chitaley and Kate 1975) is unilocular fibrous berry having fleshy epicarp, fibrous mesocarp with vascular supply having three seeds. In the present fossil fruit mesocarp is fleshy and parenchymatous and bean shaped seeds is clearly seen. So, the present fruit is different from already reported fossil fruit *Kremocarpon aquatica*.

Mohgaonkalan eydei (Yawale, 1977) is unilocular, many seeded berry and globose in shape while present fossil fruit is spherical is shape, bilocular and shows well preserved seeds.

Kremocarpon indicuum (Upadhye and Patil, 1978), the present specimen shows similarities in fruit berry. But differs in bilocular condition observed in transveese plane and also differ in shape and size hence it is different from present fossil fruit.

Cucurbitaceocarpon sahini (Bobade, 2005) the present specimen shows similarities in dicotyledonous type pericarp is differentiated but present fossil fruit differs in seed with seed coat.

Solanaceocarpon agashi (Thorat , 2015) It is spherical in shape globose and fleshy in nature but present fossil fruit differs in having bean shaped seeds with seed coat.

From the above discussion and comparison, it is observed that the fossil fruit is more or less similar to fruit of family Rubiaceae. When Present fossil fruit is compared with the genus *Mussaenda* showing in having subglobose or ovoid in shape with linear calyx.While the genra *Terenna* and *Randia* from same family are considered for comparison showing the similarity in having two celled berry fruit but differing in number of seeds which are more than two. Finally when compared with genus *Coffea* showing close resemblances with two celled berry and presence of two seeds having massive endosperm in seed as reserved food tissue. So the present fossil fruit is assigned in family Rubiaceae and the fruit is named as genus *Coffeocarpon.* The fossil history of family Rubiaceae goes back up to Eocene period ,which supports the assigning the present fossil fruit in the family Rubiaceae. The species name is given after Deccan trap as deccanii.

Diagnosis
***Coffeocarpon* gen. nov.**
Fossil berry fruit sphericla in shape, globase and fleshy in nature, fruit broadly divided into the fruit wall. Pericarp (Epicarp, Mesocarp and Endocarp). Seed with seed coat. Endosperm is the principal reserve tissue of the seed.

***Coffeocarpon deccanii* gen. et sp. nov.**
Fossil berry fruit shperical in shape, globose and fleshy in nature, measures 1.56 mm in diameter, fruit broadly divided into fruit wall that pericarp (Exocarp, Mesocarp and Endocarp) and seeds. Pericarp is about 8 μ in thickness and consist of parenchymatous cells and differentiated into epicarp, mesocarp and endocarp.

Thin walled rectangular to oval shaped epicarp measures about 7.98 μ x 53.2 μ. Endopermous seed measures in thickness 127.68 μ. Very thin walled rectangular parenchymatous cells of seed coat or spermoderm measures in thickness 0.93 μ x 0.13 μ.

Holotype :- MOH / SWD/ DICOT/ FRUIT – I

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Locality :-Mohgaonkalan, Dist. Chhindwara, M.P. India

Horizon:- Deccan Intertrappean Bed. India.

Age :- Upper eretaceous.

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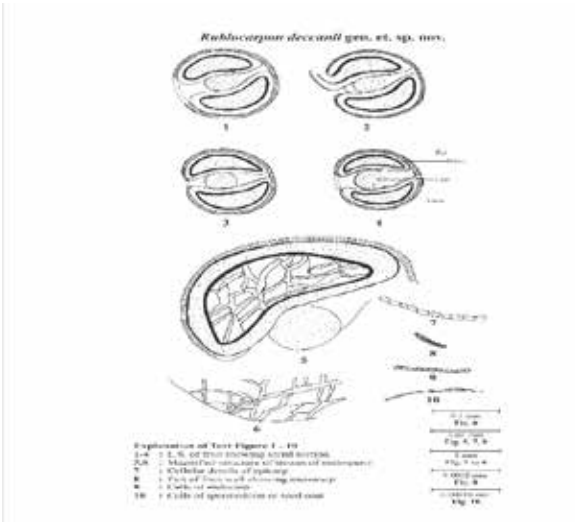

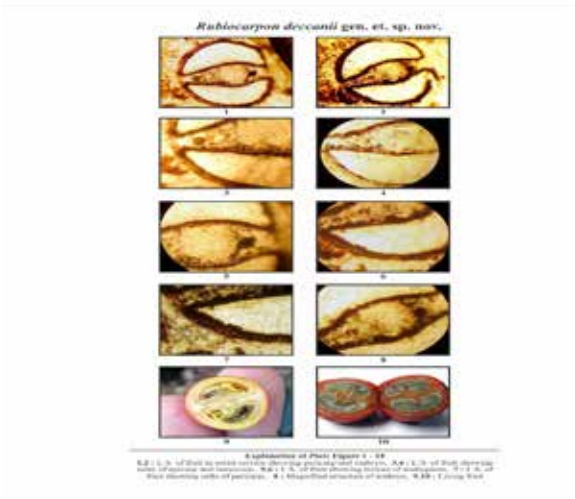

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