GENERAL INTRODUCTION

Introduction: The family Leguminosae Juss. (Nom.altern. Fabaceae Reichb.) is the third largest family among flowering plants and according to Willis (1973) the family has 600 genera and 12000 species (according to National Academy of Sciences, U.S.A. 650 genera and 18000 species). The members of this family are cosmopoliton in distribution occurring in temperate zones, humid tropics, arid zones, high-lands, savannas and low lands. There are a few aquatic legumes also.

The family is subdivided in the following manners. According to Bentham and Hooker (1862-1883) the family is subdivided into three subfamilies.

1) Caesalpinioideae: About 76 genera and 2,800 species, mainly trees of tropical savannas and forests of Africa, South America, and Asia.

2) Mimosoideae: About 56 genera and 2,800 species, mainly small trees and shrubs of semi-arid tropical and sub-tropical regions of Africa, North and South America and Australia.

3) Papilionoideae: About 482 genera and 6,400 species; mainly herbs. Distributed worldwide.
According to Hutchinson (1964) the family Leguminosae is split into three separate families and these are:

i) Caesalpiniaceae: About 152 genera and 2,800 species

ii) Mimosaceae: About 56 genera and 2,800 species

iii) Papilionaceae: About 482 genera and 12,000 species

He further classified Caesalpiniaceae into two subfamilies:

i) Caesalpinoideae and (ii) Brachystegioidae. Caesalpinoideae is divided into 5 groups encompassing 125 genera while Brachystegioidae contains 27 genera.

Rendle (1979) recognised three subfamilies of Bentham & Hooker (L.C.).

Takhtajan (1969) recognised Fabales as a separate order under which he recognised Mimosaceae, Caesalpiniaceae and Fabaceae (Papilionaceae) as three distinct families. Cronquist (1968) placed the family Leguminosae under Rosales.
Review of Literature

A large number of workers have contributed to our knowledge of the anatomical features in the family and these are; Ayensu, (1977); Anon (1977, 1982); Boodle (1914); Bhattacharya and Maheshwari (1973); Baranova (1975); Burkard (1976); Banerji & Sircar (1974); Banerji, Maity and Hore (1979); Bleckmann (1976); Bleckmann & Hull (1975); Bleckmann, Hull, Hoshaw (1980); Baudet (1978); Bezerra, Prisco & Afranio Fernandes (1979); Bravo, Lilia (1978) Ban, Alzira Dornelles, Ludwig Muller, Beatriz Hausen, De Souza, Torresia Strehl & Carmen Suzana, Arbelo Martins (1981); Bir & Kumari (1982); Cotthem (1970); Contin, Luiz Fernendo (1974); Coetzer, Robbertse & Reynek (1976); Chakraborty (1975); Cutler (1978); Dormev (1946); Dilcher (1974); Dickison (1975); De Menezes, Eurides Mambreu (1981); Esau (1977); Elias (1978); Flores, Eugenia & Ana Espinoza (1977); Fleurat-Lessard, Pierette and J.L. Bonnemain (1978); Gupta (1961); Gupta, Mohini & Y.S. Mutry (1977, 1978); Gupta, Mohini (1979); Guinet & J. Vassal (1978); Guinet, J. Vassal, C.S. Evans & B.R. Maslin (1980); Gupta, Amal K. Dutta (1979); Guddes & Dupuy (1980); Gramalei & M.V. Nakho- mova (1981); Gill, Olabanji, Husaini (1982); Hickey (1973); Harmer (1976); Hul & Michel (1977); Hull, Bleckmann (1977);
Humbert (1977); Hoc (1981); Hunde (1982); Inamdar & Patel (1972); Irwin, & R.C. Barneby (1978); Iqbal & A.K.M. Ghosh (1979); Kannabiran & K.H. Krishna Murthy (1974); Kannabiran (1975; 1976); Kundu (1974); Kupicha, Frances (1975); Kothari & Shah (1974, 1975); Kravrina (1976); Krukoff, Boris (1976, 1982); Kenrick, Knox (1980); Levin (1929); Lackey (1978); Lasseter & G.R. Guin (1979); Leelavathi, Ramayya & Prabha-
kar (1980); Murty, Johri, Mohan Ram & Varghese (1972);
Marquete, Osnier, Jose, Helio-Magalhaes & Charisse Alves (1974); Malville (1976); Matos, Felipe (1978); Marechal, Jean-
Mescher & Francois (1978); Maslin (1979); Metcalfe & Chalk (1979); Mouton (1979); Menezes, Burides, Mambre de (1981);
Nieschlova & Jaroslav (1976); Patel (1974); Pettigrew, L.
Paliwal & Anand (1978); Patel, Vishnu Bhat & I.L. Kothari (1979); Paria, S.C. Dutta & S. Sen (1981); Pedley (1981);
Pedersen & Grainger (1981); Robertse (1975); Rosjedin (1976);
Rajagopal & Ramayya (1977); Rammohann & Vijay Laxmi Nayyar (1978); Roth & Bifano (1979); Rao, I.L. Kothari & J.J. Shah (1979); Ross (1979); Reddy & G.L. Shah (1979); Rasa (1980);
Senn (1938, 1943); Simpson, Burkart & N.J. Chrman (1975);
Singh (1976, 78); Sythyk, O.A. Dyul Din; L.I. Musatenko &
T.L. Bohdanova (1976); Shah (1976); Shah & Kothari (1976);
Sell, Weberling, Lorenzen (1977); Subramanian (1979);
Singh & B.A. Phillips (1980); Sharma, C. Chandler, M. Rupley,

Works on pollen morphology have been done by Aldridge (1842); Archi (1968); Assemen (1971); Aytug, Aykut, Merev & Edis (1971); Alyoshina (1973); Adams & Morton (1976); Adams & Smith (1977); Batalla (1940); Barth (1965a); Barth & Bouzada (1964); Barth & Yoneshigue (1966); Bonnefile (1971b); Balseco & Caratini (1973); Bronckers & Stainir (1972); Barros (1966); Bhattacharyya, Datta (1976); Coetzee (1955); Cefalu & Smiraglia (1957-1958); Caccavari (1970); Cookson (1964); Clarke & Kupicha (1976); Cowan (1976); Caratini & Guinet (1973); Chanda, Sahas (1968); Chanda, Ghosh, Nilson (1979); Crompton (1982); Dnyansagar (1955); Dyakowska (1959); Deshpande, Chaitaley (1976); Deshpande & R.K. Bhasin (1976); Erdtman (1945C, 1952, 1969); Edgeworth (1877); Fritzwoh (1837); Fischer (1890); Faegri (1964); Ferguson (1978, 1981); Ferguson & John Skvarla (1979, 1981, 1982); Ferguson & Strachan (1982); Gibon (1955); Guinet (1964, 62, 69); Graham & Tomb (1974 S, 1977); Gonzalez
Quintero (1967); Gapochka & L.P.Chamara (1980); Gomes (1966a); Gupta, Murty (1978); Guedes (1982); Hassal (1842); Hoffman (1930); Huang (1968, 1972); Heusser (1971, 1975); Hul (1975); Hanks, Sharon, David (1977); Ikuse (1954a, 1956a); Jain & Nanda (1966); Kapoor, Nair (1975); Kostrikova (1976); Kavanaga & I.K.Ferguson (1981); Kuprianova & Alyoshina (1972); Kapp (1969); Larson (1964 a-T) Larson et al (1962); Labouriau et al (1965); Laere, Wael (1982); Larsen, Supee Saksuwan (1975-3); Meier & L.P. Chamara (1978); Mitra and Mondal (1982); Mondal, Mahapatra Saha & Mitra (1974); Miege, Jacques Anne Crapon De Caprona & Dan (1978); Makino, Hiroko (1978); Melhem, Therzinha Sant & Hiroko Makino (1978); Muller (1970); Martin & Drew (1970); Martin (1932); Moore & La Garde (1926); Mekhtieva (1969); Mukherjee (1969-a); Mallik et al (1964); Miege & Darrasse (1959); Melhem & Labouriau (1963); Maley (1970); Nika (1954); Neving & Niezoda (1979); Nair & Sharma (1962-a); Nair & Kapoor (1974); Ohashi (1971-a,1973, 1971); Ohashi & Hideki Takahashi (1981); Palacios (1968, 1970); Prakash & Y.Y.Chan (1976); Pire (1974); Paria, S.C. Dutta and Chanda (1979); Poole (1979); Punt, Clark, eds. (1981); Rao & Tian (1974); Rao & Lee (1970); Raj & Suryakanta (1973-a); Ross (1973); Stainer (1974); Sorsa (1969); Sen (1975); Stainier, Françoise, Horvat (1978, 1983);
Sharma (1968); Surova & Goposka (1970-3); Sladkov & Samoilovich (1954); Sladkov (1967); Sowunni (1974); Saoji, & Chaitaly (1972); Sayedud-din et al (1942); Selling (1947); Srivastava (1957); Smith (1964); Schmitz (1973-S, 1977); Saxena & Vishnu-Mittre (1977); Small, Basset, Crompton (1981); Trivedi, G.D.Bagchi & Usha Bajpai (1979); Tweari & Nair (1978); Ting-Su (1949); Takeoka (1965); Ueno (1979); Vishnu Mittre & Sharma (1962); Van Campo (1958); Verdoourt (1978; 1970); Vartak & Shyam (1978); Wang (1960); Wang (1962); Wang & Uu (1954); Zinderen & Coetzee (1959).

The palaeobotanical and palaeopalynological records so far unearthed from the Indian sub-continent give a glimpse of the origin of Leguminosae during the early Tertiary (Prakash, 1974; Awasthi 1974; Chitaley 1974; Ramanujam, 1974; Gupta, 1975; Ghosh 1979; Roy & Ghosh, 1979a & b; Bande & Prakash, 1980).

The fossil records are preserved mostly as woods, \(^\text{1}\) some leaves and fruits comparable to *Acacia*, *Cassia* & *Hedysareae* are also known. The palynological evidence of the occurrence of Leguminosae is as old as Palaeocene (Dutta & Sah, 1971) and a large number of Miocene records.
The best known earliest Quaternary Leguminosae are preserved in Karewas of Kashmir (Mitre & Sharma, 1966) and in other Quaternary formations (Gupta, 1966; Mitre et al 1967; Chanda & Mukherjee, 1969; Sharma, 1971).

The cultivation of legumes in India perhaps started in Neolithic period recorded from the Harappa civilization (2500 B.C.). *Pisum arvense* has been recorded from there. Other Leguminous remains in the archaeological sites are *Medicago denticulata*, *M. falcata*, *Lathyrus spheaericus*, *Vicia sativa*, *Dolichos bifloras*, *Phaseolus mungo*, *P. aureus*, *Lens culinaris*.

There are two important works dealing with cytology in relation to taxonomy of Leguminosae by Senn (1938, 1943) and Darlington & Wylie (1955), where they have given the chromosome number of many genera of Caesalpiniaceae, Mimosaceae & Papilionaceae.

*Area of Investigation*

In the present investigation plants belonging to Leguminosae have been studied only from those occurring within the geographical limits of Bardhaman district (Burdwan) of West Bengal. Bardhaman district extends from 22°56' to 23°53' north latitudes and from 86°48' to 88°25'
east longitudes. The district is bounded on the north by the Santal-Parganas of Bihar, Birbhum and Mursidabad, on the east by Nadia, on the south by Hooghly, Bankura and Purulia districts and on the west by Dhanbad district of Bihar.

The river Damodar forms a natural boundary to the south with Purulia & Bankura, while Bhagirathi river forms the eastern boundary. The total area of the district is 7,008.02 square-kilometre.

Geology of the district:

According to Sengupta (1970); Banerjee & Hunde (1967); the following geologic formations occur within Burdwan district:

| Later post - Dharwar Injection Complex | Streaky, injection, augen and sillimanite gneisses. |
| Earlier post - Dharwar Intrusives | Granites, pegmatites, aplites and some quartz veins. Metadolerites and metanorites with or without olivine. |
| Rapikivi - bearing gneisses and epidiorites. |
Dharwar

Gneisses, amphibolites, epidiorites and hornblended schists.

Quartzites (granulitic and schistose) and Calc-gneisses.

Micaceous schists.

The exposed part of the Archean Shield is marked by a number of intracratonic Gondwana basins along the river Damodar. A few exposures of early Tertiary also occur near Durgapur. These Gondwana basins contain huge deposits of commercially exploited coal belonging to Raniganj formation. Due to this reason, coal industry, steel industry and ancillary industries have developed in the north-western part of the district.

Soil-types in the district:

Different types of soils are encountered in different topographical, biological, hydrological and geological conditions within the district.

Coarse gritty soil blended with rock-fragments is formed in the north-western part of the district due to the weathering of pegmatites, quartz and conglomeratic sandstones. Elsewhere in the district sandy-soil are found along river courses due to metamorphism of igneous rocks. These give rise to reddish brown ferruginous soil
and sometimes laterite. Fine grained loamy soil derived from carbonaceous shales and coal seams occur widely within the district which is good for paddy cultivation (Bugchi & Dey, 1967).

Climate:

The proximity of the Bay of Bengal and the conditions of surrounding lands are the chief determinants of the climate within the district. According to Chatterjee (1953) the district experiences a climate which is warm temperate rainy conditions with mild winter. The maximum rainfall occur during the summer months when the relative humidity between the middle of May to the middle of October is very high. Temperature varies from 25°C to 35°C during summer months and mean temperature in the winter months i.e. between mid October to mid February varies from 10°C to 15°C.

Large number of severe cyclones occur in the pre-monsoon season i.e. between middle of April to the middle of May.

On an average there are 70 rainy days in a year. The range of rainfall/year is 1350.7 mm. Out of this rainfall during the monsoon months i.e. from June to
September constitutes about 75% of the annual rainfall. The variation in the rainfall from year to year is not large.

**Flora of Burdwan:**

According to Roychoudhury (1964) the flora of Burdwan is characterised by arborescent species such as *Salmalia malabarica* Schatt & Endl.; *Azadirachta indica*; *Leuca coromandelica* Merr., *Phyllanthus emblica*, *Cocos nucifera*; *Phoenix dactylifera* L., *Borassus flabellifer* L.; *Ficus religiosa* L.; *Butea frondosa*, *Caesalpinia pulcherrima*, *Mangifera indica* L.; Shrubby species such as *Glycosmis pentaphylla* Corr., *Polyanthes tuberosa* Willd.; *Clerodendron infortutum* Gaertn.; *Barleria cristata*, *Tinospora cordifolia*, * Ocimum sanctum*, *Solanum torvum* Sw.; *S. verbascifolium* L.; *Trema orientalis* Bl.; *Streblus asper* Lour. and *Ficus hispida* L. The uplands of the Asansol subdivision and the laterite areas of the district are in places covered with trees *Shorea robusta* Gaertn.; *Madhnea latifolia*, *Butea monosperma*. *Bambusa arundinacea*, *Albizia lebbek*, *Calotropis gigantea*, *Diospyros melanoxylon*, *Terminalia arjuna* and *T. tomentosa*.

In the used up coal mines, ditches and rocky plains mainly two groups of communities are dominating. Firstly,
the communities of *Lantana* and secondly, *Papaver*. The
*Lantana* attains some height during monsoon and have
attractive pink-white and reddish flowers. It forms a thick
shrub forest. *Papaver* thrives on alkaline soil but never in
association with *Lantana*. The carnivorous plant, *Drosera*,
brown in colour with sticky hair on its body, is found in
rocky areas during winter. The common plants in hedges
and wastelands are *Jatropha gossypifolia* L.; *Urena lobota* L.;
*Heliotropium strigosum* Willd.; *H. indicum* L.; *Imperata
arundinacea*, *Sida veronicifolia* Lam.; *S. cordifolia* L.; etc.
The common aquatic and marsh weeds found in the jheels and
swamps in the eastern parts of the district are: *Saccharum
spontaneum*, *Andropogon squarrosus*, *Casulia axillaris* Roxb.
*Vallisneria spiralis* L.; *Hydrilla verticillata* Lasp.;
*Potamogeton indicus* Roxb. & P. *crispus* L. *Jussiaea repens* L.;
*Eragrostis cynosuroides*, *Utricularia stellaris* L.F. &
U. *flexuosa* Vahl.; *Lemna paucicostata* Hegelm.; *Wulffia
arrhiza* Winn.; *Cyperus rotundus*; *Ceratopteris thalictroides*
Brogn.; *Monochoria hastaefolia* and *M. vaginalis* Presl.;
*Eichhornia crassipes*, *Ottelia alismoides* Pres.; *Pistia
stratiotes* L., *Sagittaria guayanensis* H. B.K.; *Najas
graminea* Del., *Typha angustata* Chub. & Bory.; *Hygrorhiza
aristata* Nees.; *Leersia hexandra* Sw. and *Nelumbium
speciosum*. The most interesting features of the flora is
the fact that here we find, growing side by side, a few
species characteristic of the Punjab and Rajasthan area, that have managed to find their way through Bundelkhand and Bihar thus far to the east, and a few equally characteristic of Coromandel and the Circars, that have succeeded in spreading through the deltaic plans of Orissa and Midnapore, thus far to the north. One of the most interesting members of the later category is the monotypic, Compositae species, Sphaeromorphaea russeliana DC.

In addition to the above works on Burdwan flora, Bhattacharyya (1974) described the flora of this district.
