Jour. Advanced Pl. Sciences Vol. 4, No. 3 & 4, 2009

ISSN : 0971-9350

IMPORTANT BEE PLANTS OF JALUKBARI AREA, GUWAHATI, ASSAM

DULUMONI SAHARIA* AND GC SARMA

Depatment of Botany, Gauhati University, Guwahati-781014

ABSTRACT

The pollen content of 20 honey samples from five preselected bee colonies were subjected to qualitative and quantitative melissopalynological analysis. This analysis demonstrated that out of 20 samples only 4 samples were unifloral (> 45per cent of pollen grains) and others were multifloral (< 45per cent of pollen grains). Unifloral species were *Brassica campestris* Linn., *Mimosa pudica* Linn. and *Eucalyptus sp.* About 45 pollen types were identified belonging to 34 families. Other important species were *Hibiscus rosa- sinensis* L, *Impatiens balsamina* L, *Azadiracta indica A.* Juss. *Syzygium cumini* (L) Skeels, *Zizyphus mauritiana* Lamk., *Anthocephalus chinensis* (Lamk) A. Risch ex Walp., *Bombax ceiba* Linn. etc. Seasonal analysis also revealed that percentage of occurance in winter season was 62per cent, premonsoon was 60per cent, monsoon was 40 per cent and premonsoon was 33per cent. The occurance of particular pollen type depended on the flowering period of plant.

Key words: Melissopalynology, pollen, honey bee.

INTRODUCTION

Nacter is an important source of the carbohydrate needed for the growth and development of honeybees, whereas pollen is the main source of proteins, fatty substances, minerals and vitamins (Gary 1975). Pollen are essential for the growth of larvae and young adult bees (Dietz1975).The honey bees collect pollen of entomophilous and anemophilous plants (Parker 1923, Chaturvedi 1973). Analysis the pollen taxa in the honey and pollen load reveals information on nectar and pollen source plants foraged by the honey bees. The study of botanical and geographical origin of honey by subjecting honey sediments to microscopic analysis for pollen grains contained therein is called melissopalynology or mellitopalynology is a branch of palynology. The botanical origin of honey is one of the most important parameters of honey quality (Tucak *et al.* 1998, 2000, 2004). According to Jones and Bryant (2004), pollen found in honey is used to determine the honey's type. Different geographical areas present particular floral association and the climatic differences are more conspicuous in the floral association. The determination of geographical origins generally based on the entire pollen spectrum being consistent with the flora of a particular region (Louveaux *et al.* 1978) or the presence of a combination of pollen type of that particular area.

For melissopalynological study we have selected Jalukbari area (26°8′56½N 91°38′56½E) because of rich vegetation. This area is famous for Assam Engineering College, Ayurvedic College and Gauhati University and is situated 10 km away from the heart of the city and surrounded by hillock and its forests. Dominant vegetation of this area is grass, *Cassia sps.*, *Derries indica* (Lamk) Bennt, *Tectona grandis* Linn. f., *Samanea saman* (Jacq.) Messil, *Zizyphus mauritiana* Lamk., *Bombax ceiba* Linn., *Bambusa* sp. etc. Some cultivated plants *Acacia* sp., *Caesalpinia pulcherrima* (L) So, *Eucalyptus* Sp. etc are also dominant species of this area. A characteristic feature of this area is swamp and marsh vegetation.

*Pandu College, Guwahati

Numbers of ponds and swamp areas are present here. These portions are occupied by *Eichhornia crassipes* Solm., *Nymphoides cristatum* Ktze., *Monochornia hastate* Prest., *Nelumbo nucifera* Linn., and species of *Polygonum*.

The aim of the present study was to determine the pollen spectrum from honey samples and provide some information regarding nectar and pollen sources for beekeepers. The other major aim is to recognize the local vegetation through microscopic analysis of honey.

MATERIALS AND METHODS

20 honey samples were collected from domestic bee hives during the period of Dec. 2007 to Nov. 2008. We had considered four seasons i.e. winter (Dec-Feb), premonsoon (Mar-May), monsoon (June-Aug), postmonsoon (Sep-Nov) to collect 20 samples, 5 samples for each season.

Season	Name of samples
Winter (Dec-Feb)	1a,1b,1c,1d,1e
Premonsoon (Mar-May)	2a,2b,2c,2d,2e
Monsoon (June-Aug)	3a,3b,3c,3d,3e
Postmonsoon (Sep-Nov)	4a,4b,4c,4d,4e

For pollen analysis of the honey samples, the laboratory method used is the standard procedure as recommended by Louveaux *et al.* (1970, 1978). For microscopic study three slides were prepared for each sample and examined the pollen contents under the compound microscope. Qualitative analysis were undertaken by counting and attempting to identify up to 1,000 pollen grains per honey samples. Frequency classes were determined to classify the number of pollen grains in to 5 groups of 200 pollens .Pollen grains were identified up to the level of species, genus and family.

The frequencies of occurance of the different types of pollen grains (recorded as per cent) were determined by counting the number of honey samples in which they appeared. The pollen grains frequency classes are designated as dominant (D>45per cent), secondary (S=16-44per cent), important pollen type (M=3-15per cent) and minor pollen type (T<3per cent) (Jones and Bryant 2004). The honey samples have been classified as unifloral or multifloral. The percentage reqired for unifloral (>or = 45per cent of total pollen grains) and multifloral (<45per cent of total pollen grains) nature has been determined according to Sawyer (1981, 1988).

RESULTS AND DISCUSSION

After qualitative and quantitative studies 45 pollen types belonging to 34 families are identified from 20 no's of samples up to species level as far as possible. Pollen

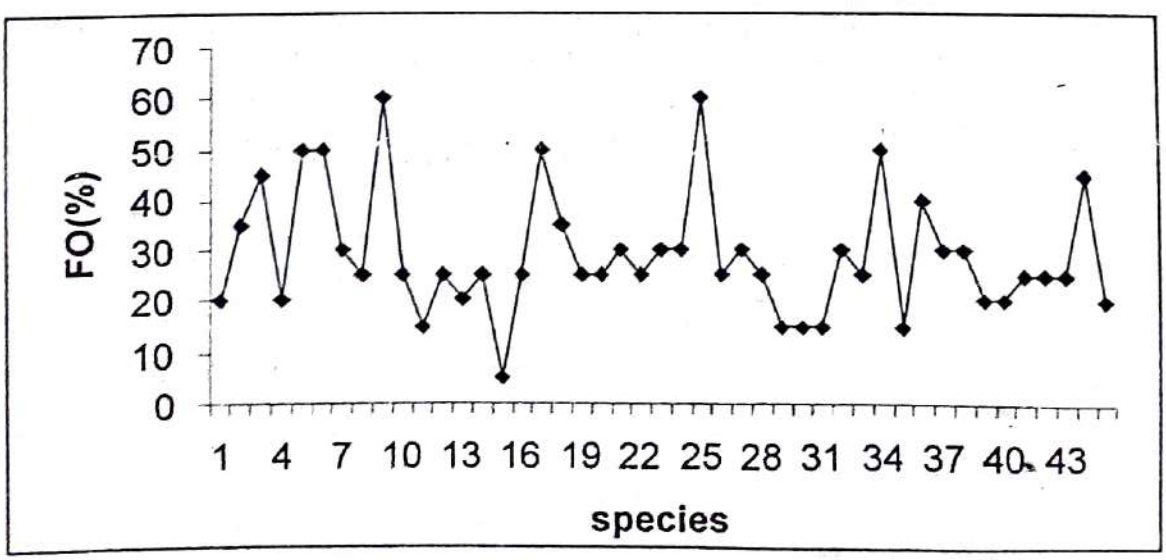


Fig 1. Pollen diagram

analytical data of the samples are given in Table-1 and the families are arranged according to Bentham & Hooker system of classification. Frequency classes and frequency of occurrences (in per cent) are also given in same table and data are graphically analyzed in Fig-1. According to season wise the analytical data are discussed below.

Winter (Dec-Feb) 5 samples (1a,1b,1c,1d,1e) were collected during this season and after microscopically analysis the author have found large numbers of pollen types. About 28 pollen types were identified and out of total 45 pollen types their per cent of occurance was 62%. Predominant species was *Brassica campestris* Linn.

Premonsoon (Mar-May) 27 pollen types were identified from 5 samples (2a, 2b, 2c, 2d, 2e) and out of total 45 types their occurrences was 60per cent. Predominant species were *Brassica campestris* Linn. *and Mimosa pudica* Linn

Monsoon (Jun-Aug) collected samples were 3a, 3b, 3c, 3d, and 3e. 18 pollen types were identified from these 5 samples. Out of 45 pollen types their occurance in this season was 40per cent. Predominent pollen types of this season was *Mimosa pudica* Linn.

Post monsoon 5 samples were collected and labeled as 4a,4b,4c,4d and 4e of which one sample is unifloral where *Eucalyptus sp.* was predominant one. From 5 samples 15 pollen types were identified and per cent of occurance was 33per cent of 45 polen types.

From 20 samples 4 sampls were classified as unifloral and others were as multifloral. Therefore multiflorality is the main characteristics of honey. The occurance of particular pollen type depends on the flowering period of plant. In this work the pollen of *Eucalyptus sp.* (65per cent) is highest frequency of occurance in honey samples. This can be explained by the wide spread distribution of that plant where it is cultivatedas a forest and ornamental species.The occurance of pollen types were winter 62per cent, premonsoon 60per cent, monsoon 40per cent, postmonsoon 33per cent (total pollen types 45) which were graphically analyzed in Fig-2.

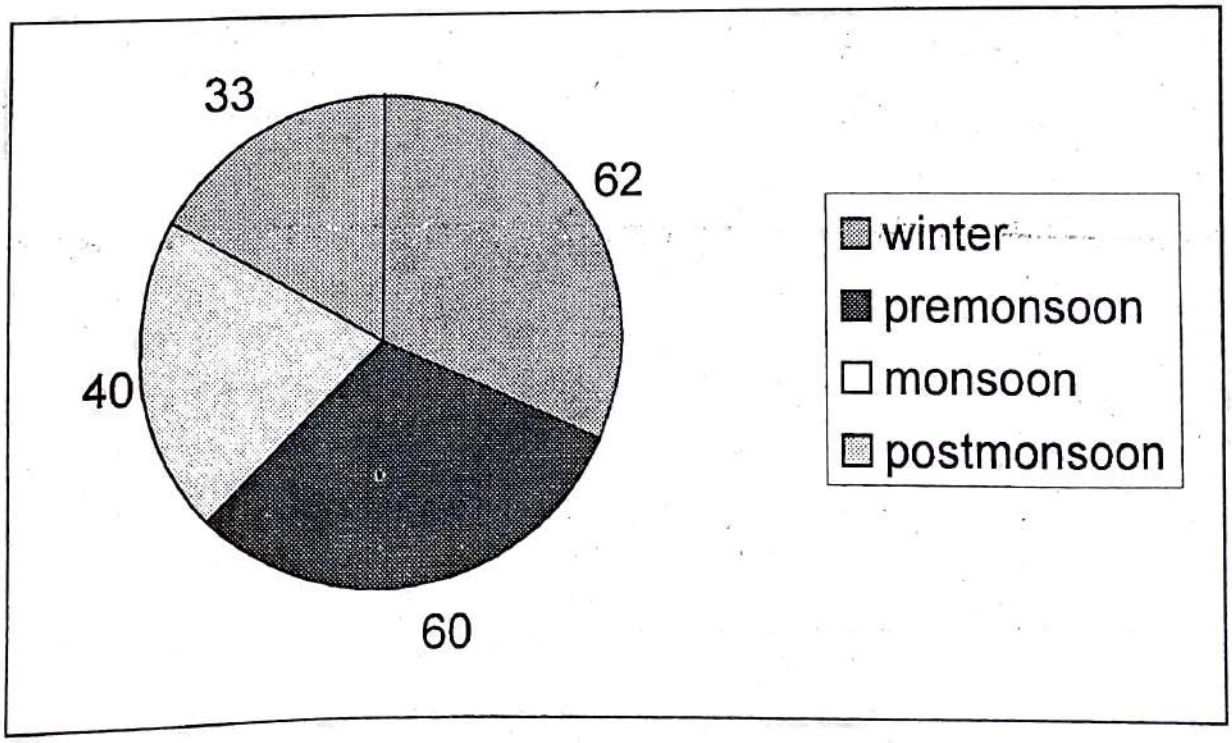


Fig 2. Per cent Occurrence of Pollentypes

CONCLUSION

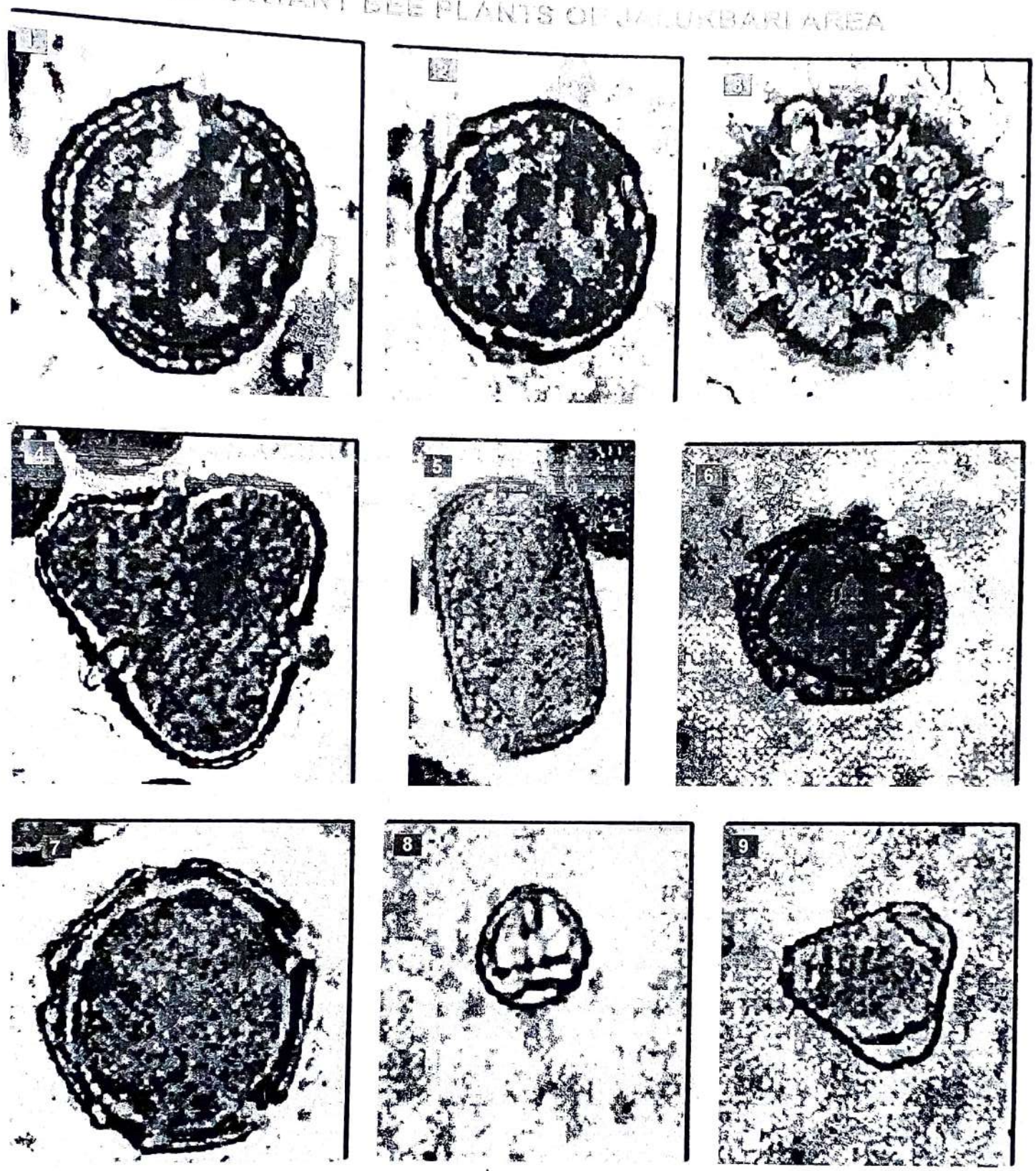
The pollen spectra of these as shown from the quantitative pollen analysis in this study indicated that honeybees transversed conciderable distance in search of suitable food materiales eg necter for their survival and production of honey. The presence of these large number of pollen types also indicated that the honey samples were pure and not adulterated.

This study has also led to the identification of major plants visited by bees in this area. This is therefore the possibility of utilizing this rich bee flora of this area for the development of apiculture.

Table 1. Frequency classes and frequency of occurrence of the 45 pollen types identified in 20 samples.

No. of samples	Family / Pollen	Type Samples	D	S	M	TFO (%) DICOT.
1. Nymphaceae *Nelumbo nucifera* Gaertn.	3a,3b,3c,3e			3	1	20
2. PAPAVERACEAE *Argemone Mexicana L.*	1a,1c,1e, 2b,2c,2d,2e		2	3	2	35
3. BRASSICACEAE *Brassica campestris* Linn. *Raphanus sativum* L.	1a,1b,1c,1d,1e 2a,2c,2d,2e 1a,1c,1d,1e,2c	 2 3	 1	 7 	 	 45 20
4. CLEOMACEAE *Cleome viscosa* Linn.	3a,3b,3c,3d,3e, 4a,4b,4c,4d,4e	2	6		2	50
5. MALVACEAE *Hibiscus rosa- sinensis* L.	1b,1c,2a,2d,3c 3e,4a,4c,4d,4e		8	2		50
6. BOMBACACEAE *Bombax ceiba* Linn.	1a,1e,2b,2c,2d,2e	4	1	1		30
7. OXALIDACEAE *Oxalis sp*	1a,1b,1c,1d,1e		2	2	1	25
8. BALSAMINACEAE *Impatiens balsamina* L.	1a,1c,1d,1e,2d,2e, 3a,3b,4a,4d,4e,	4	5	3		60
9. RUTACEAE *Citrus* sp. *Murrya exotica* Linn.	2b,2e,3a,3b,3c		2	1	2	25
10. MALIACEAE *Azadiracta indica* A.Juss. *Cedrela toona* Roxb.	2b,2c,2e 2a,2b,2c,2d,2e 1c,1e,2a,2b,2d	1 3	 5 	2 1	 	15 25 20
11. RHAMNACEAE *Ziziphus mauritiana* Lamk	3a,3b,3c,3d	5				25
12. ANACARDIACEAE *Rhus sp.*	3a	1	5			
13. MORINGACEAE *Moringa oleifera* Lamk	1a,1b,1c,1d,1e		4	1		25
14. MIMOSACEAE *Mimosa pudica* Linn. *Acacia sp.*	2b,2c,2d,3a,3b, 3e,4b,4c,4d,4e 4b,4e,1a,1d,1e,2d,2e	 1 4	 7 1	 2 2	 	 50 35

15. CAESALPINIACEAE						
Bauhinia acuminata Linn	4d,1a,1c,2d,2e	2	3	25		
Cassia sp.	2a,2c,3a,3d.3e	3	2		25	
Caesalpinia pulcherrima (L) So.	1d,1e,2a,2b,2d,2e	4	2			30
16. PAPILONACEAE						
Butea monosperma (Lamk.) Taub	1a,1c,1d,2a,2b	3	2	*25*		
Erythrina stricta Roxb.	1a,1b,1e,2a,2b,2e		4		2	30
17. MYRTACEAE	1b,1d,1e,2a,2c,2e	5	1		30	
Syzygium cumin i(L)Skeels	1a,1b,1c,2a,2b,2d,2e,					
Eucalyptus sp.	3a,3b,4b,4c,4d,4e	1	8	4	65	
18. LYTHRACEAE						
Lagerostroemia speciosa (L) Pers	c,1d,1e,2a,2c	3	2		25	
19. ONAGRACEAE						
Jussiaea repens Linn	3b,3c,3e,4a,4b,4d	4	1	1		30
20. RUBIACEAE						
Anthocephalus chinensis (Lamk) A. Risch ex Walp.	1a,1b,1c,1d,1e	3	2		25	
21. ASTERACEAE						
Tridex sp..	4d,1b,3c	3		15		
Helianthus anus Wall.	1b,1c,1e	1	3	15		
22. CONVOLVULACEAE						
Ipomea sp.	1a,1b,1d	3		15		
23. SOLANACEAE						
Solanum sp	3c,3d,3e,4a,4d,4e	4	2	30		
24. ACANTHACEAE						
Adhatoda vasica Nees.	1a,1b,1c,1d,1e,		4	1	25	
25. VERBENACEAE	1a,1b,1c,1d,1e,2a,		8	2	50	
Tectona grandis L.f.	2b,2c,2d,2e					
26. LAMIACEAE	4a,4c,4d	2	1	15		
Ocimum canum Sim						
27. AMARANTHACEAE	1b,1c,1d,2b,3a,	2	6	40		
Amaranthus Sp.	3c,3e,4a					
28. POLYGONACEAE						
Polygonum sp	2b,2c,2e,3a,3d,3e	2	4	30		
29. EUPHORBIACEAE						
Ricinus communisms L	1b,1e,2b,2e,	3	1	2	30	
Drypetes roxburghii (Wall.)	3a,4e					
Hurusawa.	2a,2b,2c,2e	4	20			



SOME IMPORTANT POLLEN TYPES

1. *Brassica campestris* Linn. 2. *Cleome viscosa* Linn. 3. *Hibiscus rosa- sinensis* L 4. *Bombax ceiba* Linn. 5. *Impatiens balsamina* L 6. *Citrus* sp. 7. *Azadiracta indica* A. Juss. 8. *Mimosa pudica* Linn. 9. *Eucalyptus* sp.

30. CASURINACEAE *Casuarina equisetifolia* Forst MONOCOT.	1a,1b,1d,2a	4	20			
31. LILIACEAE *Allium cepa* L. *Allium sativum* L	1a,1b,1c,1d,1e 1a,1b,1c,1d,1e.	5	5		25	25
32. PONTEDERIACEAE *Eichornia crassipes* (Mart) Solms.	1a,1c,1d,1e,2a	3	2	25		
33. ARECACEAE *Cocos nucifera* Linn.	1a,1d,1e,2a,2d, 3b,3e,4a,4d	5	4			45
34. POACEAE	3d,3e,4a,4b		1	2	1	20

Frequency classes: Values indicate the number of samples in which the different pollen types appeared at the following percentages >45per cent: Predominent pollen (D); 16-45per cent: Secondary pollen(s); 3-15per cent: Important Minor pollen (M); <3per cent: Minor pollen (T), FO: Frequency of occurrence,RTY: Round the Year.

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