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Melissopalynological studies in the Darrang district of Assam, India

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Abstract

The importance of melissopalynological study is well known. Honey samples were collected from the Darrang district of Assam, India, during January to December 2015. The extracted pollen grains, after identification, are belonging to 42 species representing 41 genera and 27 families. Of these, while 19 species are wild and 17 are cultivated. There are at least six species which are both cultivated and wild. Considering the habit groups, there are 13 species of trees, nine species of shrubs, 15 species of herbs and the remaining five are climbers.

Importance of melissopalynological studies in the management and promotion of epiculture in Assam also has been discussed.

Key words: Melissopalynology, honey, pollen, Darrang district, Assam

INTRODUCTION

Melissopalynology is an applied branch of palynology dealing with the study of pollen grains present in honey and the application of such knowledge in Apiculture and different other honey related works. Plant produces nectar and pollen both, which are avidly sought after by the bees to provide nutrition to the colony for day-to-day consumption and also storing for the future. Evaluation of plants for their utility as sources of bee forage provides information needed to assess the potential for beekeeping in an area (Moses *et al.*1987; Ramanujan *et al.*1991). Melissopalynological studies are thus helpful in bee management and in promoting apiculture. According to Bhargava *et al.* (2009) data from pollen analysis reflects the floral situation of the place where particular honey was produced and the identification of geographical origin based on the presence of a combination of pollen types of that particular area.

Beekeeping industry, one of the important agricultural and forest based rural industries in India, mainly involved in the production of commercial quantities of honey, using essential colonies of the Indian hive bee, *Apis cerana* Fabricius. Recognition and initial screening of various bee plants representing potential sources of nectar and pollen for the honey bees throughout the year, is an important pre-requisite for launching apiary industry in any locality (Kalpana *et al.* 1997). Melissopalynological studies dealing with microscopic analysis of the pollen contents of seasonal honeys and pollen loads from a locality, when supplemented with critical field studies involving phenology and floral biology provide reliable information regarding the floral types which serve as major and minor nectar and pollen sources for the honey bees (Attri 2010).

Study area

Darrang District, is located in the central part of the North-East Indian state of Assam in between 20° 9′ N to 26° 95′ N and 91° 45′ E to 92° 22′ E. The main economy of this District is agriculture, while only a few are engaged as government employee or with other occupation. The area is mainly plain-land and several rivers are flowing through the District. Dominant plants of this area are different types of grasses, *Bambusa* sp., *Cassia* spp., *Ficus* spp., *Bombax ceiba*, *Brassica campestris* (seasonal), *Azadirachta indica*, *Ziziphus jujuba*, *Moringa oleifera*, *Butea monosperma*, *Neolamarckia cadamba*, *Ageratum conyzoides*, *Justicia adhatoda*, *Polygonum* sp., *Oryza sativa* (cultivated), etc.

The aim of the present study is to identify the important bee foraging plants of this area, and to generate awareness among the local people about the potentiality of beekeeping industry.

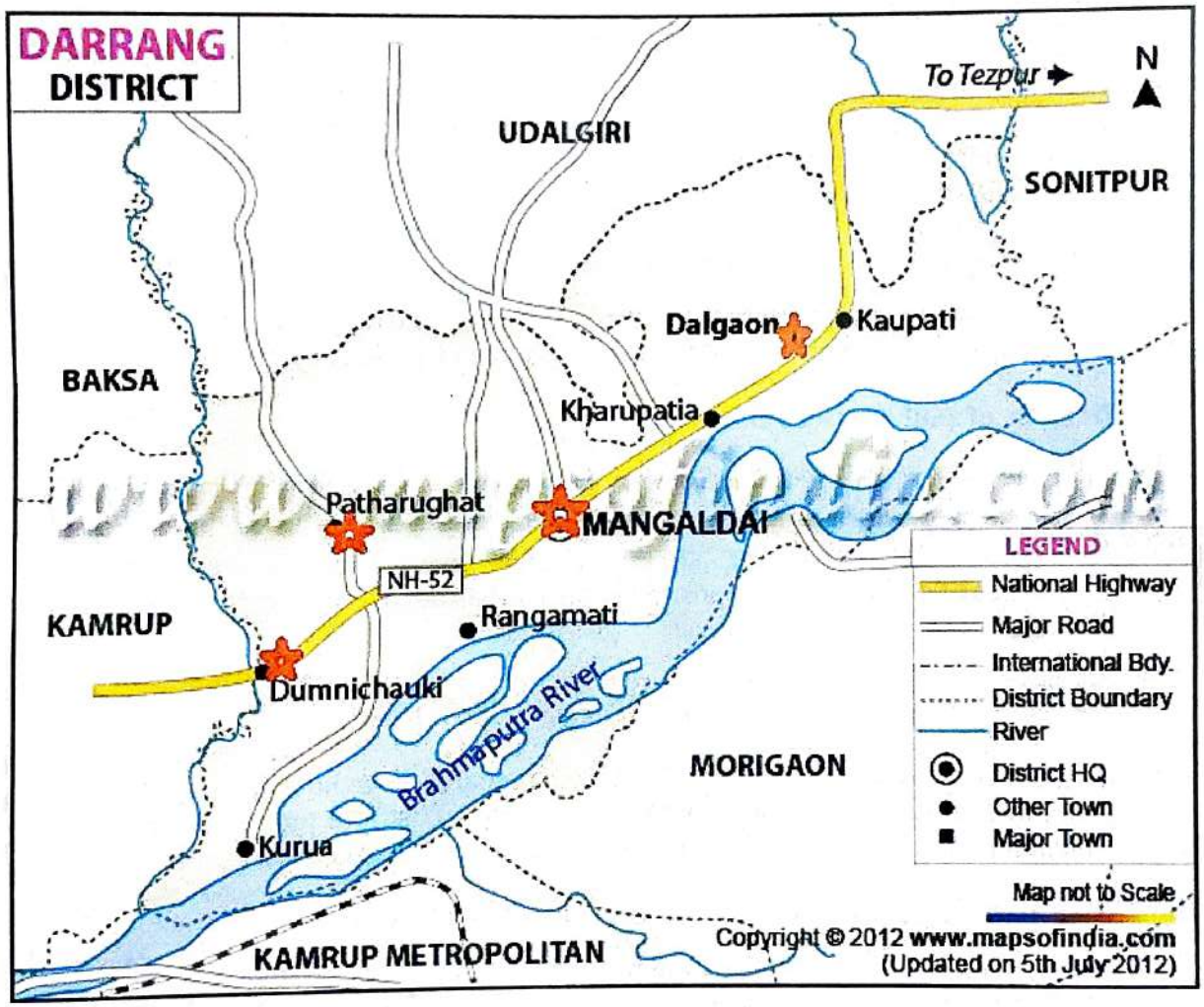

Figure 1. Map of Darrang District showing four sampling localities [Source: www.mapsofindia.com]

For melissopalynological analysis 16 honey samples were collected from four locations in the Darrang district of Assam during January to December, 2015. Samples were taken from naturally occurring bee hives in the area.

The name of the samples and their localities are given in Table 1.

Table 1. Localities, collection date and code-name of honey samples

Locality	Sample code	Date of Collection	Locality	Sample code	Date of Collection
Dalgaon	D_1	05.01.2015	Dumnichauki	U_1	12.01.2015
	D_2	03.03.2015		U_2	25.03.2015
	D_3	04.05.2015		U_3	21.05.2015
	D_4	06.11.2015		U_4	17.11.2015
Mangaldai	M_1	07.01.2015	Patharughat	P_1	10.01.2015
	M_2	12.03.2015		P_2	21.03.2015
	M_3	13.05.2015		P_3	14.05.2015
	M_4	22.11.2015		P_4	12.11.2015

Preparation of pollen slides from honey samples

10 ml of honey samples was taken in a test tube and diluted to 50 ml with hot distilled water at 40° C. The solution was centrifuged at 3000 rpm for 10 minutes and the process was repeated twice for washing. The tubes were then kept inverted over a filter paper at 45° angle for an hour to remove the excess water. Then the sediment was acetolysed following Erdtman's (1960) method.

Preparation of pollen slides from fresh materials

Reference slides were prepared from the anthers collected from large flower-buds following acetolysis method of Erdtmann (1960) to identify the honey pollens by matching.

Identification of pollens from honey

Pollen identification was done on the basis of reference slides made from live materials collected from the study area and consulting published literature (Erdtman 1954; Nair 1970; Gupta & Sharma 1986).

Both types of slides will be deposited in the Herbarium of the Department of Botany, Gauhati University.

RESULTS AND DISCUSSION

The data produced through the study of the slides prepared from honey samples has been summarized in Table 2. From 4 collecting sites of Darrang District a total 16 honey samples were collected and analyzed. After analysis 42 Angiospermic plant species belonging to

Table 2. Distribution of plant species according to their habit and nature of each locality

Collection site and number of species	Habit				Nature		
	Herb	Shrub	Tree	Climber	Wild	Cultivated	Wild & Cultivated
Dalgaon (18)	5	6	6	1	8	6	4
Mangaldai (23)	11	3	8	1	11	9	3
Dumnichauki (25)	8	4	11	2	10	8	7
Patharughat (23)	9	4	8	2	9	10	4

Table 3. Identified Angiospermic plants from honey samples along with their families, local names, habits and nature of occurrence

[*Abbreviations used*: **Collection sites:** D = Dalgaon; M = Mangaldai; U = Dumnichauki; P = Patharughat. **Occurrence:** PO% = % of occurrence. **Frequency:** FC = Frequency Class; D = Dominant (>45 % of total pollen grains); S = Secondary (16 – 45 % of total pollen grains); M = Important Minor (3 – 15 % of total pollen grains); T = Minor (< 3 % of total pollen grains)]

Plant name [Family]	Local name	herb/ shrub/ tree	Wild/ Cultivated	Collection site	PO%	FC
Abelmoschus esculentus (Linnaeus) Moench [Malvaceae]	*Vendi*	Herb	Cultivated	M	25	M
Ageratum conyzoides (Linnaeus) Linnaeus [Asteraceae]	*Sagun Tulasi*	Shrub	Wild	P	25	T
Andrographis paniculata (Burman f.) Ness [Acanthaceae]	*Kalmegh*	Herb	Wild	D, M,P	75	M
Averrhoa carambola Linnaeus [Oxalidaceae]	*Kordoi*	Tree	Cultivated	D,M,	50	S
Azadirachta indica A. Jussieu [Meliaceae]	*Mahaneem*	Tree	Wild & cultivated	D,M,U,P	100	S
Basella alba Linnaeus [Basellaceae]	*puroi*	Climber	Wild & cultivated	U	25	T
Bombax ceiba Linnaeus [Malvaceae]	*Simolu*	Tree	Wild	U,P	50	S
Brassica rapa Linnaeus [Brassicaceae]	*Sarioh*	Herb	Cultivated	M,U,P	75	D
Citrus aurantiifolia (Chirstmann) Swingle [Rutaceae]	*Gol nemu*	Shrub	Cultivated	D,U	50	T
Cocos nucifera Linnaeus [Arecaceae]	*Nari col*	Tree	Cultivated	U	25	T
Coriandrum sativum Linnaeus [Apiaceae]	*Dhonia*	Herb	Cultivated	M,P	50	D
Cucumis sativus Linnaeus [Cucurbitaceae]	*Tianh*	Climber	Cultivated	D,U	50	T
Cucurbita maxima Duchesne [Cucurbitaceae]	*Ronga lao*	Climber	Cultivated	M	25	T
Cyanthillium cinereum (Linnaeus) H. Robson [Asteraceae]	*Joni-bon*	Herb	Wild	M,U	50	M
Eichhornia crassipes (Martius) Solms [Pontederiaceae]	*Meteka*	Aquatic herb	Wild	D,P	50	T
Gardenia jasminoides J. Ellis [Rubiaceae]	*Tagar*	Shrub	Cultivated	M,P	50	M
Gmelina arborea Roxburgh [Verbenaceae]	*Gamari*	Tree	Wild	U	25	M
Hibiscus rosa- sinensis Linnaeus [Malvaceae]	*Joba*	Shrub	Cultivated	U,P	50	S
Justicia adhatoda Linnaeus [Acanthaceae]	*Bahak*	Shrub	Wild	D, M, U	75	M
Lagerstroemia speciosa (Linnaeus) Persoon [Lythraceae]	*Ajar*	Tree	Wild	M,U,P	75	S
Lawsonia inermis Linnaeus [Lythraceae]	*Jetuka*	Shrub	Cultivated	D	25	T
Litchi chinensis Sonnerat [Sapindaceae]	*Lichu*	Tree	Cultivated	M,U,P	75	S

Plant name [Family]	Local name	herb/ shrub/ tree	Wild/ Cultivated	Collection site	PO%	FC
Luffa cylindrica (Linnaeus) M. Roemer [Cucurbitaceae]	*Bhol*	Climber	Cultivated	P	25	T
Mimosa pudica Linnaeus [Leguminosae]	*Lajuki lata*	Herb	Wild	D,M,U,P	100	D
Momordica charantia Linnaeus [Cucurbitaceae]	*Tita kerala*	Climber	Cultivated	P	25	T
Moringa oleifera Lamarck [Moringaceae]	*Sajina*	Tree	Wild & cultivated	D,U,P	75	S
Morus australis Poiret [Moraceae]	*Mulberry*	Tree	Wild & cultivated	M,U,P	75	T
Neolamarckia cadamba (Roxburgh) Bosser [Rubiaceae]	*Kadam*	Tree	Wild & cultivated	D,U	50	D
Ocimum americanum Linnaeus [Lamiaceae]	*Kolia tulsi*	Herb	Wild	M	25	T
Oryza sativa Linnaeus [Poaceae]	*Dhan*	Herb	Cultivated	D,M,P	75	T
Oxalis corniculata Linnaeus [Oxalidaceae]	*Bar tengasi*	Herb	Wild	M,U	50	T
Persicaria chinensis (Linnaeus) H. Gross [Polygonaceae]	*Modhu-soleng*	Herb	Wild	U	25	M
Persicaria hydropiper (Linnaeus) Dilarbre [Polygonaceae]	*Bih-lagni*	Herb	Wild	U,P	50	M
Psidium guajava Linnaeus [Myrtaceae]	*Madhuri*	Shrub	Cultivated	D,M,U,P	100	M
Ricinus communis Linnaeus [Euphorbiaceae]	*Aragoch*	Shrub	Wild	D	25	M
Saccharum spontaneum Linnaeus [Poaceae]	*Luhia*	Herb	Wild	D,M,P	75	T
Senna alata (Linnaeus) Roxburgh [Leguminosae]	*Kharpat*	Shrub	Wild	D	25	T
Sesamum indicum Linnaeus [Pedaliaceae]	*Til*	Herb	Cultivated	U,P	50	T
Sida rhombifolia Linnaeus [Malvaceae]	*Saru Sun-Borial*	Herb	Wild	M,U	50	T
Syzygium cumini (Linnaeus) Skeels [Myrtaceae]	*Kala-jam*	Tree	Wild & cultivated	D,M,U,P	100	S
Toona ciliata M. Roemer [Meliaceae]	*Tunagoch*	Tree	Wild	M	25	T
Ziziphus jujuba P. Miller [Rhamnaceae]	*Bogari*	Tree	Wild	D,M,U,P	100	D

41 genera and 27 families were identified. The number of dicot plant species were 39 under 25 families whereas 3 plant species under 2 families were from monocot. With four species Cucurbitaceae appeared as the highest contributor, followed by Meliaceae (3 spp.) and Malvaceae (3 spp.). Details of the identified pollen contributors has been provided in Table 3. The analysis of occurrence revealed that four plants *Azadirachta indica*, *Mimosa pudica*, *Psidium guajava* and *Syzygium cumini* were found in all the four collection sites.

The identified plant species were classified in to four frequency classes i.e. "Dominant" (D: >45 % of total pollen grains) represented by five plant species, "Secondary" (S: 16 – 45

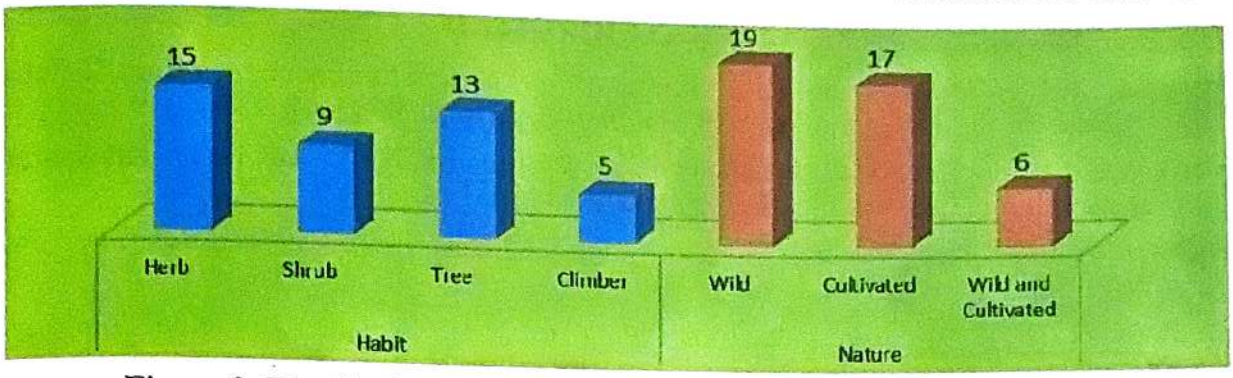

Figure 2: Distribution of Angiospermic plant species in habit and nature

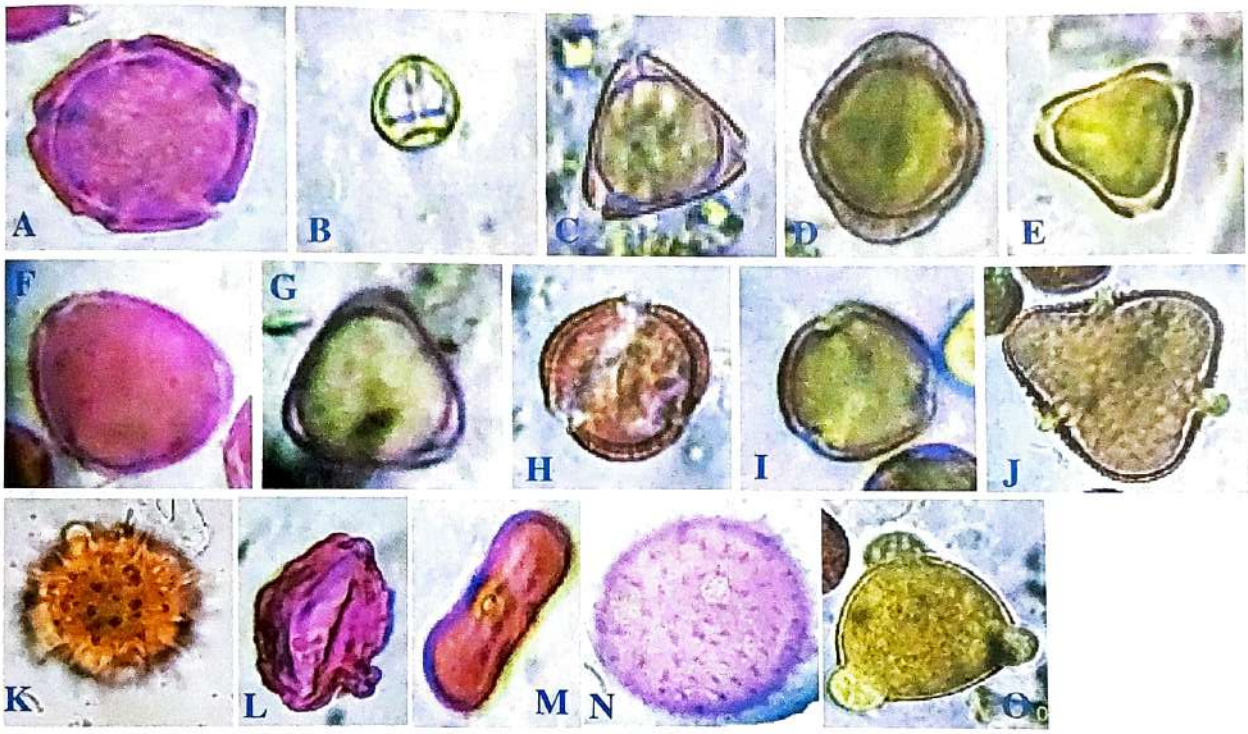

PLATE - I. Microphotographs of pollens recognized from honey samples collected from the Darrang district of Assam: A. *Azadirachta indica;* **B.** *Mimosa pudica;* **C.** *Psidium guajava;* **D.** *Lagerstroemia speciosa;* **E.** *Syzygium cumini;* **F.** *Moringa oleifera;* **G.** *Ziziphus jujuba;* **H.** *Brassica rapa;* **I.** *Neolamarckia cadamba;* **J.** *Bombax ceiba;* **K.** *Hibiscus rosa-sinensis;* **L.** *Cocos nucifera;* **M.** *Coriandrum sativum;* **N.** *Cucurbita maxima;* **O.** *Morus australis*

% of total pollen grains) which covers eight species, "Important Minor" (M: 3 – 15 % of total pollen grains) as much as 10 plant species and the remaining 19 species were classified as "Minor" (T: <3 % of total pollen grains). The Dominant plant species were *Neolamarckia cadamba, Brassica rapa, Coriandrum sativum* , *Mimosa pudica* and *Ziziphus jujuba.*

The identified plant species were categorized as herb, shrub, tree and climber, again they were also categorized as wild, cultivated and both wild and cultivated. Out of 42 plant species 15 were herbs, 9 shrubs, 13 trees and 5 were climbers (Fig. 2) again 19 were wild, 17 cultivated and 6 were both wild and cultivated (Table 2).

This type of data helps a beekeeper to know the plants which are important for honey production and important measure to develop the apiculture practice.

LITERATURE CITED

Attri, P.K. 2010. Melissopalynological Studies of *Apis cerana* Summer honey from Chamba District of the Himachal Pradesh. *Asian J. Exp. Biol. Sci.* 1(4): 930 – 939.

Bhargava, H.R.; Jyothi, J.V.A.; Bhushanam, M. & Surendra, N.S. 2009. Pollen analysis of Apis Honey, Karnataka, India. *APIACTA*. 44: 14 – 19.

Erdtman, G. 1960. TheAcetolysis Method – ARevised Description. *Svensk. Bot.Tidskr.* 54: 561 - 564.

Erdtman, G. 1954. *An Introduction to Pollen Analysis*. Chronica Botanica Company. Stockholm.

Gupta, H.P. & Sharma, C. 1986. *Pollen Flora of North-East Himalaya*. Indian Association of Palynostratigraphers, Lukhnow.

Kalpana, T.P. & Ramanujan, C.G.K. 1997. Melittopalynology bee plant and beekeeping potential in some costal district of Andhra Pradesh, India. *Indian bee J.* 59: 1 – 8.

Moses T.S.; Singh, J.; Madhukanta A. & Suryanarayana M.C. 1987. Evolution of sources of pollen to Honey Bees at Viyayarai (Andhra Pradesh), *Proc. 5th All India Symp. Palynol*, Department of Botany, Institute of Science, Nagpur, India, October 7 - 9, pp. 65 – 71.

Nair, P.K.K.1970. *Pollen Morphology of Angiosperm*. Scholar Publishing House. Lukhnow.

Ramanujam, C.G.K. & Khatija, F. 1991. Melittopalynology of the agricultural tracts in Guntur District, Andhra Pradesh. *J. Indian Inst. Sci.* 71: 25 – 34.